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REQUEST FOR COMPETITIVE SEALED PROPOSALS
#
CSP 27-020
HVAC Projects 2026-2027

CSP PROPOSAL ITEM: HVAC Projects 2026-2027, 700 Med High Dr, Mercedes, Texas 78570, 10650 North Expressway 77/83, Olmito, TX 78575, 510 S Sugar Rd, Edinburg, TX 78539

DEADLINE: Thursday, November 5, 2026
2:00 p.m. (CST)

CSP Proposal Package: Information on specifications may be obtained at the South Texas Business Office, 7001 E. Expressway 83, Mercedes, TX 78570, (956) 565-2454, or download at https://www.stisd.net/departments/business-finance/purchasing/bid-opportunities

Email requests may be sent to: frank.trevino@stisd.net cc reynaldo.cantu@stisd.net, dmonreal@gmsarchitects.com, & sylvias.garza@stisd.net CSP Proposals should be mailed or hand delivered to:

ATTN: Purchasing Department,
South Texas ISD Administration
7001 E. Expressway 83., Mercedes, TX 78570.
CSP 27-020 HVAC Projects 2026-2027
Due Date:CSP Proposals will be accepted until Thursday, November 5, 2026, at 2:00 p.m. CST

The successful bidder will be required to provide 100% performance and payment bonds. No bidder proposal can be withdrawn for a period of sixty (60) days prior to selection. STISD is not responsible for proposals misplaced or mailed incorrectly. CSP Proposals received late will not be accepted and will be returned.

Sylvia Garza
Chief Financial Officer for Federal Programs
South Texas ISD

INSTRUCTIONS TO PROPOSERS

Article I. Nature of Project:

1. *General Information*. The South Texas Independent School District, (District) (hereafter called the "Owner") will receive Competitive Sealed Proposals for:

HVAC Projects 2026-2027, MERCEDES, TX OLMITO, TX EDINBURG, TX – SOUTH TEXAS INDEPENDENT SCHOOL DISTRICT

(hereafter called the "Project") in accordance with the Drawings, Specifications, and other Contract Documents prepared by Gomez Mendez Saenz, Inc. (hereafter called "Architect") dated July. 31, 2026.This Request for Competitive Sealed Proposals ("CSP") is the only step for selecting a General Contractor for the Project as provided by Chapter 2269, Subchapter D of the Texas Government Code. The CSP provides the information necessary to prepare and submit Competitive Sealed Proposals for consideration and ranking by the Owner. The Owner may select the Proposal that offers the "best value" for the District based on the published selection criteria and weight of criteria, and on its ranking evaluation. As indicated herein, factors other than price will be considered in making this determination. Following evaluation and ranking of the Proposals by an evaluation committee, and approval of the rankings by the District's Board of Directors, the District may first attempt to negotiate a contract with the selected Proposer. As permitted by statute, the District may discuss with the selected Proposer options for a scope or time modification and any price change associated with the modification. If the District is unable to reach a contract with the selected Proposer, the District may formally end negotiations with that Proposer and proceed to the next ranked Proposer in the order of the selection ranking until a contract is reached or all proposals are rejected.

2. *Project Description and Scope*.

The Project will generally include the following Scope of Work: HVAC Projects for South Texas ISD Science Academy

South Texas Independent School District – Health Professions, Medical Professions, & World Scholars to be located at 700 Med High Dr, Mercedes, Texas 78570, 10650 North Expressway 77/83, Olmito, TX 78575, 510 S Sugar Rd, Edinburg, TX 78539. The scope of the Project is more specifically described in the Drawings, Specifications, and other Contract Documents for the Project prepared by the Architect, dated July 31, 2026.

3. *Points-of-Contact*.

a. The Owner designates the following person, as its District representative with regard to this CSP.

Dr. Sandra Garza Ochoa., PhD.
Superintendent of Schools South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570
Telephone: 956-565-2454
Email:sandra.ochoa@stisd.net

Sylvia Garza
Chief Financial Officer for Federal Programs
South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570 Telephone: 956-514-4222 Email: sylvias.garza@stisd.net

Frank Trevino, Executive Director for Facilities and Construction
South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570
Telephone: 956-514-4266
Email: frank.trevino@stisd.net

b. The Owner designates the following person, as its Architect representative regarding the technical Drawings and Specifications:

Mr. David Monreal, AIA

Gomez Mendez Saenz, Inc

1150 Paredes Line Road
Brownsville, Texas 78521
Phone: 956-546-0110
Email: dmonreal@gmsarchitects.com

Respondents shall restrict its contact with the Owner and direct all questions regarding this CSP, including questions regarding terms and conditions, to the District Representative, Program Consultant or Architect. Do not contact members of the Board of Directors or any other employee of the South Texas Independent School District. **Contact with any of these prohibited individuals after issuance of the CSP and before selection is made, may result in disqualification of your proposal.**

Article II. Form of Proposals:

1. Proposals must be submitted in by mail, or hand delivered **": HVAC Projects 2026-2027 CSP Proposal # 27-020 HVAC PROJECTS 26-27** and bearing the name and address of the Proposer. CSP Proposals are to be addressed to the Board of Directors, South Texas Independent School District, and are to be delivered to the Business Office of South Texas ISD, Attn: Purchasing Department, South Texas Independent School District, 7001 E. Expressway 83., Mercedes, TX 78570 prior to **2:00 o'clock p.m. CST, Thursday, November 5, 2026.** At such time and date, - Administration, located at 7001 E. Expressway 83., Mercedes, TX 78570. **Proposals received after the deadline will not be accepted.**

2. To achieve a uniform review process and obtain the maximum degree of comparability, it is required that proposals be organized in the manner specified. **Three (3) sets** of the proposal response are required, including one original set. The original set should be labeled "ORIGINAL" and contain original signatures, preferably in blue ink. The remaining sets are to be copies of the original and are to be labeled "COPY". Respondents are expected to examine this RFQ carefully, understand the terms and conditions for providing the services listed herein and respond completely. **FAILURE TO COMPLETE AND PROVIDE ANY OF THE ITEMS REQUIRED HEREIN MAY RESULT IN THE RESPONDENT'S PROPOSAL BEING DEEMED NON-RESPONSIVE AND THEREFORE DISQUALIFIED FROM CONSIDERATION.**

The proposal shall be submitted in the order set forth below. Each section should be separated by a tab or divider of some kind to indicate the response to the individual request for information:

A. MONETARY PRICE PROPOSAL. Provide a Stipulated Sum Price Proposal for all labor, services, materials, tools, equipment, and supervision necessary for final completion of construction of the Project in accordance with the Project Schedule, Contract Documents (including General, Supplementary and other Conditions of the Contract), Drawings and Specifications, Addenda and other Construction Documents provided. Proposer's Offer shall include no amount for sales or use taxes for which District is exempt. Such taxes shall not be reimbursable costs. Proposer's Monetary Proposal shall be prepared on the form attached hereto as **CSP *Attachment A***.

B. PROPOSER QUALIFICATION GENERAL QUESTIONNAIRE: Complete and submit the Proposer Qualification General Questionnaire, ***CSP Attachment A-1.***

C. FELONY CONVICTION NOTIFICATION: Complete, sign and submit the Felony Conviction Notification Form, ***CSP Attachment B.***

D. NON-COLLUSION AFFIDAVIT: Complete and submit the Non-Collusive Affidavit of Prime Proposer, ***CSP Attachment C.***

E. BID SECURITY. Submit Bid Security documents as required by Article III. of this Request for Competitive Sealed CSPProposals.

G. CONFLICT OF INTEREST QUESTIONNAIRE. (CIQ). Complete, sign and submit the Conflict of Interest Questionnaire attached as ***CSP Attachment D.***

H. SIGNATURE PAGE: Complete, sign and submit Signature Page, ***CSP Attachment E.*** The Signature Page must be signed by a person, or persons, authorized to bind the entity, or entities, submitting the proposal. Proposals signed by a person other than an officer of the company or partner of the firm shall be accompanied by evidence of authority.

2. Proposals must be submitted on the forms promulgated by Owner and accompanied by bid security as set out in Article III. below. No Proposal shall be made orally, by telephone, by facsimile ("fax") transmission or by any other electronic means. All proposals shall be computed exclusive of the Texas Sales Tax; that is, such tax shall not be added to the amount offered for the construction of the Project

3. A proposal may be withdrawn by hand-delivered written document or fax request received by Owner prior to the time fixed for opening. Two signed copies of any such written or fax withdrawal should be forwarded immediately to Owner in a sealed opaque envelope properly marked to identify the contents.

5. Owner reserves the right to request supplemental information of any and all Proposers to aid the Owner in the evaluation process.

Article III. Bid Security:

1. Proposer must submit a certified or cashier's check or proposal bond, made payable to the South Texas Independent School District, executed by a corporate surety acceptable to the District, which is licensed pursuant to the Texas Insurance Code and listed on the United States Department of the

Treasury's Listing of Approved Sureties (Dept Circular 570).

2. The bond amount or check shall be in the amount **5% of the of the largest possible total of the Proposer's Monetary Proposal**. The Proposal Bond must be valid for sixty (60) days following the deadline for submission of proposals; must be conditioned upon the Contractor entering into the Contract in writing with the Owner in accordance with terms of the proposal, and furnishing such bonds and other instruments as may be specified in the Contract Documents with good and sufficient Surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; must be accompanied by an original signed and notarized Power-of-Attorney bearing the seal of the issuing surety company; and reflect that the signatory to the bond is a designated Attorney-in-Fact.

3. Time is of the essence, and the award of the contract to the successful Proposer is expressly conditioned upon (i) the Proposer's execution and delivery of the contract, and delivery of all required payment and performance bonds and evidence of insurance, within ten (10) calendar days after the successful Proposer is notified of the acceptance of its Proposal, and (ii) the Proposer's timely fulfillment of any and all other preconditions expressly set forth in the Contract Documents. Should the Proposer fail to timely execute and deliver the contract, required bonds, evidence of insurance, or fail to timely fulfill any other such preconditions, the Owner may, at its option and discretion, without releasing, impairing or affecting its right to receive the security as damages for such failure, rescind the award and thereafter negotiate with and award the contract to the next ranked Proposer, or may reject all Proposals.

4. The Bid Security deposited by all Proposers will be released/returned at such time as the Construction Contract has been executed by the successful Proposer. However, if Owner fails to accept any proposal within sixty (60) days after the date scheduled for opening of proposal and a Proposer withdraws its proposal, its bid security will be released/returned upon withdrawal.

Article IV. Selection Criteria and Methodology

1. Evaluation and ranking will be based on the Proposer's responses to the Proposer's Monetary Proposal and the Proposers Questionnaire attached hereto as **CSP Attachment A and A-1 and the criteria specified below** (weighted as indicated, against a total amount of 100%):

25%		**PRICE** The amount of Proposer's price proposal
20%		**EXPERIENCE & BACKGROUND** The Proposer's experience and background, based upon information provided by the Proposer and on other information obtained by references; previous experience with the Owner (4 points); recent experience (4 points); experience on similar projects for other school districts (4 points); record of on-time completion (4 points); experience in the South Texas area (4 points), and.
35%		**PERFORMANCE & QUALIFICATIONS** The performance and quality of the Proposer's services and completed projects, including its key personnel (5 points), record of claims and litigation (3 points), ability to schedule on-time (5 points) and in-budget completion (5 points), approach to communications (4 points), reputation for consistent on-going support, including warranty services (5 points), ability to maintain professionalism and resolve conflicts (5 points), and satisfactory safety record (3 points).
20%		**FINANCIAL RESOURCES & STABILITY** Proposer's resource capability as it relates to Proposer's ability to appropriately manage and oversee a Project of this size and scope as supported by documentation, provided by Proposer, including available resources (10 points), financial stability (5 points), and financial ability to perform the contract (5 points).

2. By submitting its Proposal, the Proposer agrees and understands that the Owner shall not be obligated to award a construction contract for this project strictly on the basis of the lowest monetary offer

proposed. The proposer also agrees to waive all rights to claims against the district, or persons authorized by the district, including the district's architect, for any damages whatsoever arising from the owner's or said person's evaluation of the proposer's proposal and/or qualifications to perform this specific project.

3. **ACCEPTANCE OF EVALUATION METHODOLOGY:** By submitting its Proposals in response to this CSP, the Respondent accepts the evaluation process and methodology, and further, acknowledges and accepts that determination of the "best value" offeror will require subjective judgments by the Owner.

4. If required by the Owner after the receipt of competitive sealed proposals, additional project cost modifications may be requested for further negotiations.

5. **Note:** During the course of the selection process, the proposals are exempt from disclosure to the public under the Texas Public Information Act, because they contain information that, if released, would give advantage to a competitor or bidder. The proposals will however, upon the award of the contract, become a public record; and therefore, subject to disclosure to any person who makes a proper request for review of the documents. Some of the information you may provide in your proposals will contain commercial or financial information which are privileged or confidential by statute, or which you feel may cause substantial competitive harm to your business if disclosed by the District to a third-party even after the award. You may be entitled to protect this information at the time the request is made for disclosure, however you will need to consult your legal counsel to assure that this kind of information, if included, is properly marked as confidential prior to submission.

Article V. Examination of Contract Documents & Site:

1. The Contract Documents including the Drawings and Specifications and General Conditions will be available on our district website https://www.stisd.net/community/public.

2. If any Proposer is in doubt as to the meaning of any part of the Drawings, Specifications, or other Contract Documents, or if he discovers what he considers to be a discrepancy, omission or conflict in such Contract Documents, he shall immediately call the Architect's attention to same by written notice or request for an interpretation of same. If such written notice or request is delivered to the Architect **prior to 72 hours before the deadline for receipt of Proposals**, the Architect shall issue a written addendum, forwarded to all persons who, to the knowledge of the Architect, are prospective Proposer setting out any corrections to such Contract Documents or the Architect's interpretation thereof, as the case may be. Any opinion expressed by Architect in interpreting the Contract Documents shall not be binding upon Owner, nor does Architect warrant that the Owner will accept his interpretation of such documents.

3. Each Proposer, before submitting his Proposal, shall fully examine and acquaint himself with the Contract Documents and the site of the proposed Project. He shall make such investigations as he may deem necessary to fully inform himself of the existing conditions, facilities, difficulties, restrictions and requirements incident to completion of the Project under the terms of the Contract.

4. Failure of the Proposer to acquaint himself adequately with the site and such conditions, facilities, difficulties, restrictions and requirements will not relieve him of his obligation to perform the entire Contract at the price set forth in this proposal.

Article VI. Contract Documents, Drawings and Specifications:

1. The form of Construction Contract utilized for this Project shall be the *Standard Form of Agreement Between Owner and Contractor where the basis of payment is a STIPULATED SUM (AIA Document A101-2017)* as amended by Owner; the *General Conditions of the Contract for Construction,*

AIA Document A201-2017, as amended by the Owner, Copies of these form of documents are attached hereto as ***Appendix A-1 and A-2*** respectively.

Article VII. Addenda:

1. Changes in or official interpretations of the Contract Documents will be made only by written addenda. Receipt of all addenda issued by Architect shall be acknowledged in each Proposer's proposal and shall constitute a part of the final contract. It is the duty of each Proposer to obtain any and all addenda and failure of a Proposer to receive any addendum will not release him from any obligation under his Proposal. However, if any Proposer fails to receive any addendum, and his offer is otherwise determined to represent the best value to the Owner, the contract may be awarded to him and the changes in the work set out in the addendum will be incorporated into the contract by a change order, with a corresponding adjustment in the contract price to be made as provided in the Conditions of the Contract.

Article VIII. Award of Contract:

1. Owner reserves the right to reject any or all Proposals. There will be no contractual obligation on the part of the Owner to any Proposer, nor will any Proposer have any property interest or other right in the contract or Work being proposed unless and until the contract is unconditionally executed and delivered by all parties, and all conditions to be fulfilled by the Proposer have either been so fulfilled by the Proposer or waived in writing by the Proposer or waived in writing by the Owner.

2. The process for awarding the contract shall be conducted in accordance with Chapter 2269, Subchapter D of the Texas Government Code:

a. On the proposal due date, the district will receive publicly open, and read aloud the names of the Proposers and all prices and qualifications stated in each proposal. Within a reasonable time, not to exceed forty-five (45) days after the date of opening the proposals, a committee to which the Board of Directors has delegated this duty, will evaluate and rank each proposal submitted in relation to the criteria and weight of criteria set out herein. Based on this evaluation and ranking by the Evaluation Committee and its recommendation, the Board of Trustees will select the Proposer that offers the best value for the District. In determining best value, the District is not restricted to considering price alone, but may consider any other factors stated in the selection criteria set out herein.

b. Utilizing this ranking, the district will attempt to negotiate an agreement with the selected Proposer. During such negotiation, the District and its engineer or architect may discuss with the selected Proposer options for a scope or time modification and any price change associated with the modification. If the district is unable to negotiate a contract with the first selected Proposer, the district will, formally and in writing, end negotiations with that Proposer and proceed to the next Proposer in the order of the selection ranking until a contract is reached or all proposals are rejected.

c. If an agreement is reached, the selected Proposer shall, within ten (10) days after notice that its proposal has been accepted execute the negotiated contract for construction with the Owner and shall furnish the Performance and Payment Bonds in forms acceptable to the Owner.

Article IX. Performance & Payment Bonds:

1. As a political sub-division of the state the District is required to obtain both performance and payment bonds. Performance bonds are required when the entire transaction (both original amount and the total of all changes, updates and additions) total over $100,000. Payment bonds are required when the entire transaction (both original amount and the total of all charges, updates and additions) total over $25,000. For this Project both **Performance and Payment Bonds in the full amount of the Contract Sum will be required.** Neither bond is required to be submitted with the original proposal submission; however, the Selected Proposer will be required to furnish a Performance Bond and a Payment Bond on forms acceptable to the Owner, at the time of execution of the Construction Contract and shall include the premiums for such bonds in Proposer's bid.

2. Such bonds must be written by a company, or companies, acceptable to and approved by Owner. Owner will not accept a bond written by any company which does not meet all of the following requirements:

a. The bond must be executed by a corporate surety or corporate sureties duly authorized and admitted to do business in the State of Texas and licensed by the State of Texas to issue surety bonds.

b. The surety or sureties executing such bond must be listed in the most current issue of the U.S. Department of Treasury Circular 570 (hereinafter called "Circular 570") as an acceptable surety

to execute bonds for federal projects.

c. The amount for which the bond is written shall not exceed the underwriting limitation prescribed by Circular 570 for the surety or sureties executing such bond.

Article X. Wage Scale:

1. The construction of this Project is subject to Chapter 2258 of the Texas Government Code. Among other things, this Chapter provides that it shall be mandatory for a Contractor and upon any subcontractor under him to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

2. In accordance therewith, the Owner has adopted the prevailing wage scale published for this area by the Department of Labor. A copy of the most recent schedule of Prevailing Wages published on the DOL website, for projects of this kind, is attached as **Appendix B,** to this Request for Proposals, and not less than this established scale must be paid on the project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the work at the time of construction.

3. If the Contractor or any of its Contractors or Subcontractors violate the provisions of the Prevailing Wage Statute above, by failing to pay the required prevailing wage to worker employed by it in the execution of the contract, the Contractor shall be required to pay the Owner the sum of Sixty Dollars and No/100 ($60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rate stipulated in the scale of prevailing wages applicable to this Project, as required by Texas Government Code Section 2258.023(b).

Article XI. Insurance and Indemnity:

1. If selected, Proposer will be required to comply with the following Insurance and Indemnification Requirements below:

a. Insurance: The Agreement which the successful Proposer will asked to enter into will contain a requirement that it shall provide and maintain certain insurance as required by the District, including, but not limited to general liability, automobile liability, and workers' compensation insurance. Such insurance shall be written for not less than the limits set out in the Article 11 of the *General Conditions of the Contract for Construction, AIA Document A201- 2017***,** as amended by the Owner, attached hereto as ***Appendix A-2*****,** or greater if required by law, and will comply with the requirements stated therein.

b. Indemnification. The Agreement which the successful Proposer will be asked to enter into will contain Indemnity provisions which are included in Section 3.18 (including subparts) of the *General Conditions of the Contract for Construction, AIA Document A201-2017***,** as amended by the Owner, attached hereto as ***Appendix A-2*****,**

Article XII. Conflicts of Interest:

1. Proposer acknowledges that it is informed that District Policy and Chapter 176 of the Texas Local Government Code requires that persons, or their agents, who seek to contract for the sale or purchase of property, goods, or services with the District, shall file a completed conflict of interest questionnaire with the appropriate district records administrator not later than the 7th business day after the date that the person:
(1) begins contract discussions or negotiations with the District; or (2) submits to the District an application, response to a request for proposals or bids, correspondence, or another writing related to a potential agreement with the District. The conflict of interest questionnaire form is available from the Texas Ethics Commission at www.ethics.state.tx.us and is attached hereto as **CSP Attachment E**.

2. Texas Government Code, Section 2252.908 requires the Disclosure of Interested Parties, by a firm contracting with the District, using the form and procedure established by the Texas Ethics Commission, at the same time it submits a signed contract, if the contract award requires action or a vote by the Board of Trustees **or** the value of the Contract awarded as a result of the solicitation is at least One Million Dollars ($1,000,000.00). The form requires disclosure of any "interested party" to the contract of which the contracting business entity is aware, and must be signed by an authorized agent of the contracting business entity acknowledging that disclosure is made under oath and under penalty of perjury. A copy of

Form 1295 and further information about the process required is attached hereto as **Appendix C.** By submission of its Response to the CSP, Respondent agrees that upon contract award and notification by the District of the applicability of this requirement, it will timely comply with the filing requirements set forth by the Commission and required by Section 2252.908 of the Texas Government Code. **Note:** The Disclosure of Interested Parties Form may only be filed electronically and **IS ATTACHED TO THIS CSP FOR REFERENCE ONLY**. Please consult your own legal advisor if you have questions regarding the statute or form.

Article XIII. Independent Contractor:

Proposer agrees and understands that, if selected, it and all persons designated by it to provide services in connection with a contract shall be deemed to be independent contractor(s), responsible for their respective acts or omissions, and that District shall in no way be responsible for Proposer's actions, and that none of the parties hereto will have authority to bind the others or to hold out to third parties, that it has such authority.

Article XIV. Criminal Background Checks:

Texas Education Code §22.08341 requires that the Contractor obtain criminal history record information ("CHRI") on **Covered Employees** with **Disqualifying Criminal Histories** (each defined below). These persons are prohibited from serving at a school district. Because of restrictions on what entities may access such information, the Contractor will be required prior to commencement of work under this Agreement, using the process established by the Owner, Contractor will be required to arrange with the Owner to obtain the national criminal history record information ("CHRI") on all of Contractor's employees, independent contractors, agents, or Subcontractors, Contractor's Subcontractors of every tier ("Subcontractors"), if any of these persons is a "Covered Employee" as defined by the Statute, i.e. the person has or will have continuing duties related to the contracted for services, and said person has or will have the opportunity for direct contact with students in connection with those continuing duties. Contractor will also be required to reimburse the Owner for the costs and expenses associated with obtaining the criminal history information by entering into the proposed Contract Documents will be required to agree to accept the Owner's interpretation of the report as to whether any Covered Employee has been determined to have a Disqualifying Criminal History and will be required to be excluded from assignment to the Project.

Article XV. Considerations/Requirements for Construction on Educational Facility Premises.

1. As the General Contractor on the Project(s) Proposer will be responsible for the actions of Contractor's forces, Subcontractor's forces and all tiers of Sub-subcontractor's forces on the Project Site(s). The Proposer recognizes that the Project Site is a public school campus, and will prohibit the possession or use of alcohol, controlled stances, tobacco, and any prohibited weapons on the Project Site and shall require adequate dress of the Contractors' forces consistent with the nature of the work being performed, including wearing shirts at all times. Sexual harassment of employees of the Contractors or employees or students of the Owner by employees of the Contractors is strictly forbidden.

2. Proposer should also take into consideration that the campus on which the Project is constructed may be operational during all or some of the construction and may cause delay or scheduling conflicts. By submission of a proposal, the Proposer represents that this has been taken into account in making its proposal.

CSP ATTACHMENT A

BID PROPOSAL FORM
(GENERAL CONTRACT)

Project: South Texas Ind. School District
HVAC Projects 2026-2027
CSP 27-020 – HVAC PROJECTS 26-27
700 Med High Dr, Mercedes, Texas 78570
10650 North Expressway 77/83, Olmito, TX 78575
510 S Sugar Rd, Edinburg, TX 78539

Place: South Texas Ind. School District, 7001 E. Expressway 83, Mercedes, Texas 78570

Date: Thursday, November 5, 2026

Time: 2:00 p.m.

1. Pursuant to and in compliance with the Invitation to Bid and the proposed Contract Documents, prepared by Gomez Mendez Saenz, Inc. relating to the above referenced project, the undersigned, having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and with local conditions affecting the performance and costs of the work at the place where the work is to be completed, and having fully inspected the site in all particulars, hereby proposes and agrees to fully perform the work within the time stated and in strict accordance with the proposed Contract Documents, and addenda, thereto, including furnishing of any and all labor and materials for all General Construction and Site Work, for the following sum of money:

A. BASE BID:
All labor, materials, services and equipment, necessary for completion of the work shown on the drawings and described in the specifications._____
_____DOLLARS ($)
_____ # of Days to Complete

B. ALTERNATES:
Alternate No. 1: At World Scholars (Edinburg) in Administration Area, Ductwork Replacement – Full replacement of ductwork within the Administration Area served by existing CHW RTU-3. Work shall include new ductwork, new supply and return air, air devices, grilles, registers, diffusers, new zone dampers, and associated controls as indicated on the drawings. The work shall also include the temporary removal and reinstallation of existing ceiling tiles, ceiling grid, and all ceiling-mounted MEP devices, including but not limited to light fixtures, speakers, fire alarm devices, sensors, and other ceiling-mounted components as required to complete the ductwork replacement._____
_____
_____DOLLARS($)
_____ # of Days to Complete

2. If awarded this Contract the undersigned will execute a satisfactory Construction Contract, Performance Bond, Labor and Material Payment Bond and proof of insurance coverage, with the Owner for the entire work as per the Contract Documents within **5** days after notice of award. It is agreed that this proposal is subjected to the Owner's acceptance for a period of Sixty (60) calendar days from the above date.

3. Contractor will require _____ calendar days to substantially complete the project. Time Extensions shall be submitted for review to the Architect, on a monthly basis. Work will be completed while there is no school instruction. Instruction Day's you will be allowed to work Monday-Friday 5:00pm – 1:00am. Weekend and Holidays can be schedule with prior arrangement with district.

4. Enclosed is a Certified Check or Bidders Bond in the amount of $_____ in compliance with the specification requirements. (5% of the highest amount bid).

The above check or Bidders Bond is to become the property of the Owner in the event the Construction Contract (when offered by the Owner) and the bonds and proof of insurance coverage are not executed within the time set forth above.

5. The undersigned agrees to the following:

1. To furnish all materials as shown and specified in the plans and specifications.
2. To start work **5** days after notice of award of contract.
3. To work _____ working days per week.

6. By signing, bidder acknowledges that **ALL ALLOWANCES** have been included in the Base Bid and that the full amount of all allowances as specified in the General Requirements, Division 1, of the specifications, is in the Base Proposal price.

7. Receipt is acknowledged of the following addendas:

No.	Dated	No.	Dated
No.	Dated	No.	Dated
No.	Dated	No.	Dated

8. Bidder agrees that the Owner has the right to accept or reject any or all bids and to waive all informalities.

9. A list of Sub-Contractors and Materials Suppliers which are proposed to be used on this project is included with this proposal in a separate envelope. Upon acceptance of proposal, substitution of Sub-Contractors or Suppliers listed may be made only with approval by the Owner.

☐ **10. We have reviewed the proposed schedule completion duration and we acknowledge that Substantial Completion of the Work can be completed within the duration specified.**

Respectfully submitted,

(Seal - if Bidder is a corporation)

By_____
Print

_____
Signature

_____
Title

_____

_____

_____
Company Name /Business Address

FILL IN APPLICABLE INFORMATION:

A CORPORATION, Chartered in the STATE of _____, authorized to do business in the State of TEXAS.

A PARTNERSHIP, composed of: _____

AN INDIVIDUAL, operating under the name of: _____

(SEAL: - if Bid is by a Corporation)

Note: If Offeror is a Joint Venture, an authorized signature from a representative of each party is required

2026-2027 Academic Calendar

July 2026

Su	M	Tu	W	Th	F	Sa
			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 2026

Su	M	Tu	W	Th	F	Sa
						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 2026

Su	M	Tu	W	Th	F	Sa
		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 2026

Su	M	Tu	W	Th	F	Sa
				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 2026

Su	M	Tu	W	Th	F	Sa
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 2026

Su	M	Tu	W	Th	F	Sa
		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 2027

Su	M	Tu	W	Th	F	Sa
					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 2027

Su	M	Tu	W	Th	F	Sa
	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 2027

Su	M	Tu	W	Th	F	Sa
	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 2027

Su	M	Tu	W	Th	F	Sa
				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 2027

Su	M	Tu	W	Th	F	Sa
						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 2027

Su	M	Tu	W	Th	F	Sa
		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			

South Texas ISD Board of Directors approved: 2.24.2026

Always Innovating

South Texas ISD

RIO GRANDE VALLEY | GRADES 6-12

First Day of Instruction	Aug 17
Last Day of Instruction	May 21

INSTRUCTIONAL PERIODS

Semester 1	**82**
Q1 Reporting Pd *(Oct 9)*	*39*
Q2 Reporting Pd *(Dec 17)*	*43*
Semester 2	**86**
Q3 Reporting Pd *(Mar 12)*	*42*
Q4 Reporting Pd *(May 22)*	*44*
Total School Days	**168**

Minutes of Operation

Q1 Reporting Period	17,940
	19,780
Q3 Reporting Period	19,320
Q4 Reporting Period	20,240
Total Minutes	**77,280**

TEA requires a minimum of 75,600 instructional minutes.

DISTRICT HOLIDAYS

Columbus Day	Oct 12
Thanksgiving	Nov 23-27
Christmas	Dec 21-Jan 8
Weather Day	Feb 15
Spring Break	Mar 15 - 19
Good Friday (Weather Day)	March 26

PROFESSIONAL DEVELOPMENT

District Staff Development

Aug 5-6, Aug 10-12
Sept. 7
Jan. 18
May 24-27

Campus Staff Development

Aug 4, 13
Aug. 7 PD/Workday
Feb 26

TEACHER WORKDAYS

Aug 14, Dec 18, May 29

ASSESSMENT DAYS

STAAR, AP, IB Assessment Days

NEW TEACHER ACADEMY

July 31 & August 3

DISTRICT FUN DAY

May 28

7001 E. Expressway 83, Mercedes, TX 78570 • (956) 565-2454 • www.stisd.net

CSP ATTACHMENT A-1 PROPOSER QUESTIONNAIRE

SECTION A - GENERAL INFORMATION

1. **Company Information:** Provide the following information regarding your company.

   Name/Name of Organization/Company: _____

   Address_____

   State:_____Zip Code:_____Telephone:_____Fax: _____

   Please attach the following information regarding business Organization (Corporation, Partnership, Individual, Joint Venture, Other): (1) the state where chartered; (2) names of all principals (officers, directors, partners, general or managing partners etc); and (3) if your organization was chartered outside of the state of Texas, a statement regarding whether are you registered to do business in Texas.

2. **Contact Information:** List the person who the District may contact concerning your proposal or setting dates for meetings.

   Name: _____

   Address_____

   State:_____Zip Code:_____Telephone:_____Fax: _____

3. Does your Company anticipate any mergers, transfer of organization ownership, management reorganization, or departure of key personnel within the next twelve (12) months that may affect the organization's ability to carry out its proposal?

   Yes ☐ No ☐

4. Is your Company authorized and/or licensed to do business in Texas? Yes

   ☐ No ☐

5. Provide any other names under which your business has operated within the last 5 years.

6. **Debarment/Suspension Information:** Has the Company or any of its principals been debarred or suspended from contracting with any public entity?

   Yes ☐ No ☐

   If yes, identify the public entity and the name and current phone number of a representative of the public entity familiar with the debarment or suspension, and state the reason for or circumstances surrounding the debarment or suspension, including but not limited to the period of time for such debarment or suspension.

7. **Surety Information:** Have you or the Company ever had a bond or surety canceled or forfeited? Yes No

   ☐ ☐

   If yes, state the name of the bonding company, date, amount of bond and reason for such cancellation or forfeiture.

8. **Bankruptcy Information:** Have you or the Company ever been declared bankrupt or filed for protection from creditors under state or federal proceedings?

   Yes ☐ No ☐

   If yes, state the date, court, jurisdiction, cause number, amount of liabilities and amount of assets.

9. **Contractor Default.** Have you or the Company defaulted and been removed from any construction Project in the last ten (10) years.

   Yes ☐ No ☐

   If yes, state the name and address of the individual or entity with whom the Project was contracted, the name of the Project, the date of removal and the reason for removal.

SECTION B – EXPERIENCE AND BACKGROUND

1. **Past Experience on Similar Projects.** Identify the three most significant clients (whether school district or non-school district projects) and three school district clients for which the Proposer has provided services similar to the Scope of Services requested by this CSP, within the past 5 years. Include a brief description of the services provided, the dates of service, and a point of contact with name, address, and current fax, email, and phone number.

2. **Past Experience with the District.** Has the Proposer performed work for the District within the last 5 years? If so, indicate if the work performed was as a prime contractor or as a subcontractor, the Project on which the work was performed, describe the work performed and the date performed.

3. **Recent Experience.** What Projects, if any, of a similar size and nature has Proposer acted as General Contractor or Construction Manager in the last twelve (12) months.

Scheduling Ability/On Time Completion/Proposed Substantial Completion Date For this Project

What percentage of the Projects on which you have acted as General Contractor in the last five (5) years, have been completed on-time? _____Percent

Of those not completed on-time, what was the cause of the delay and how did you address it?

What is your proposed Substantial Completion Date for this Project?

4. **Experience in South Texas.** Identify the three most significant clients (whether school district or non- school district projects) for which the Proposer has provided services similar to the Scope of Services requested by this CSP, within the past 5 years, in South Texas. Include a brief description of the services provided, the dates of service, and a point of contact with name, address, and current fax, email, and phone number.

SECTION C – PERFORMANCE AND QUALIFICATIONS

1. **Key Personnel.** Identify the number and professional qualifications (to include licenses, certifications, associations) of key staff to be assigned to the Project and relevant experience on projects of similar size and scope. Response provided should, at a minimum, include information regarding principals of your organization and proposed on-site project manager and/or construction superintendent and identification of the Subcontractors who you anticipate will be engaged on the Project.

2. **Record of Claims and Litigation.** Identify any claims or litigation filed against Proposer in the last 5 years related to Proposer's services, including any claims that went to mediation or arbitration. For each claim or lawsuit, identify what the party's claims against Proposer were and how they were ultimately resolved, including any monetary settlements reached between Proposer and claimant.

3. **Scheduling Ability.** Describe your scheduling abilities. Provide information on available resources, including total number of employees in your organization, number and location of offices, equipment available to support each Project.

   Describe the major projects your organization currently has **in progress**, giving the name and location of project, your role on the project (i.e. Contractor, Construction Manager, or Other), the

contract amount or GMP, percent complete and scheduled completion date. Describe any impact your current projects might have on your ability to perform the work requested in this CSP. Include in your description your ability to commence work on the Project upon execution of the applicable Agreement.

4. **Communication.** Describe your overall approach and specific practices that assure good communication with the Architect and the District's project staff involved in the day-to-day progress of a Project and a description of a situation where your communications practices avoided a potential delay or cost overruns on a Project. Include in your description your standard practices to meet deadlines and stay on schedule.

5. **Budget.** Describe your standard practices with regard to keeping the Architect and Owner apprised of the status of budgetary challenges, if any. Describe a situation where you identified and resolved an over budget issue. Include in your description your standard practices to control costs and stay within budget.

6. **Post-Completion and Warranty Services.** Provide a list of any past projects within the last 5 years, for which you are aware of any issues which arose following completion of construction (whether within or outside of warranty) of your construction services, and if a determination of the cause of the problem was made, what that determination was.

   If the determined cause was alleged to be, in whole or in part, related to your construction services, describe your involvement with resolving the claim and your interaction during the process with the client.

7. **References.** Please provide the names address, and current email and phone number of two (2) clients with whom you have worked in the last five (5) years who can provide a reference for your construction services, including your thoroughness, accuracy, reporting, recommendations and follow-through/responsiveness in working with them in connection with a post-construction issue.

8. **Safety Record.** Provide a description of your safety measures or policies and procedures during the course of the Project, and describe your safety record.

SECTION C - FINANCIAL RESOURCES AND STABILITY

1. **Resources**. Provide information on available resources, including total number of employees in your organization, number and location of offices, equipment available to support this Project.

2. **Stability.** Identify two financial references which can verify the financial stability of the firm. One of these references should be your current banking organization. For each, provide a point of contact with name, address, and current fax, email, and phone number.

3. Provide documentation demonstrating your firm's financial resources to provide the services requested in this CSP.

CSP ATTACHMENT B

FELONY CONVICTION NOTIFICATION

Texas Education Code, Section 44.034, Notification of Criminal History, Subsection (a), states "a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony."

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

This notice is not required of a Publicly-Held Corporation.

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

Vendor's Business Name _____

Authorized Company Official's Name (Printed) _____

A. My firm is a publicly-held, stock-exchange corporation, therefore this requirement is not applicable.

Signature of Company Official: _____

Date Signed: _____

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

Signature of Company Official: _____

Date Signed: _____

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony (printed name and general description of type of felony or felonies):

1. _____
2. _____
3. _____
4. _____

Signature of Company Official: _____

Date Signed: _____

CSP ATTACHMENT C
NON-COLLUSION AFFIDAVIT OF PRIME PROPOSER

STATE OF TEXAS §

COUNTY OF _____ §

_____, being first duly sworn, deposes and says this:

(1) He is of_____ (a partner or officer)
(the firm of, etc.)

the Proposer who has submitted the attached proposal.

(2) He is fully informed respecting the preparation and contents of the attached Proposal and of all pertinent circumstances respecting such Proposal.

(3) That Proposal is genuine and is not a collusive or sham Proposal.

(4) Neither the said Proposer nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly, with another Proposer, firm or person, to submit a collusive or sham Proposal in connection with the Contract for which the attached Proposal has been submitted or to refrain from proposing in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion, or communication or conferences, with any other Proposer, firm or person to fix the price or prices with the attached Proposal or of any other Proposer, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the South Texas Independent School District of Mercedes, Texas or any person interested in the proposed contract; and,

(5) The price or prices quoted in the attached Proposal are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Proposer or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Proposer's Business Name): _____

(Proposer's Representative Signature) _____

(Proposer's Representative Title) _____

THIS AFFIDAVIT SHALL BE NOTARIZED

Subscribed and sworn to before me on this _____day of _____, 20____.

_____
NOTARY PUBLIC, STATE OF TEXAS

CSP ATTACHMENT D

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____
Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____
Signature of vendor doing business with the governmental entity Date

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.

CSP ATTACHMENT E
SIGNATURE PAGE AND DECLARATION OF COMPLIANCE

Check (✓) the box that indicates business structure of Proposer

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

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

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

_____
Number Respondent Organization Name

By: _____

Printed Name: _____

Title: _____

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

Printed Name: _____

Title: _____

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

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

APPENDIX A-1
AIA Document A101- 2017 - Standard Form of Agreement Between Owner and Contractor where the basis of payment is a STIPULATED SUM, as amended by Owner

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

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

« South Texas Independent School District »« , a Texas independent school district »
« 7001 E. Expressway 83
Mercedes, Texas 78570 »
« Telephone: (956) 565-2454 »
« »

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

« [Contractor name, as selected under RFCSP No. _____] »« , [legal status of Contractor] »
« [Street address]
[City, State ZIP] »
« Telephone: [_____] »
« »

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

« HVAC Projects 2026-2027 (RFCSP No. _____) »
« Health Professions, 700 Med High Dr., Mercedes, Texas 78570; Medical Professions, 10650 North Expressway 77/83, Olmito, Texas 78575; World Scholars, 510 S. Sugar Rd., Edinburg, Texas 78539 »
« HVAC replacement and related work in accordance with the Drawings, Specifications, and other Contract Documents prepared by Gomez Mendez Saenz, Inc. dated July 31, 2026 »

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

« Gomez Mendez Saenz, Inc. »« , a Texas registered architectural firm »
« 1150 Paredes Line Road
Brownsville, Texas 78521 »
« Telephone: (956) 546-0110 »
« Fax: (956) 546-0196 »

The Owner and Contractor agree as follows.

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

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

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User Notes: (1381320808)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contract Documents consist of this Agreement as amended, Conditions of the Contract as amended (General, Supplementary and other Conditions), all sections of the Project Manual Drawings, Specifications, and Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.
(Warning: Make sure that any Supplementary Conditions do not contradict the provision of the A201, as mended).

§ 1.2 This Agreement, as amended, represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. Any revision, amendment, or modification to the Standard Form of this Agreement shall be valid, binding, and enforceable only if said revision, amendment or modification is made conspicuous by being underlined, lined-through, or highlighted in this Agreement signed by Contractor and the authorized representative of Owner's Board of Directors. In the event of conflict, terms and conditions contained in the Agreement, as amended, shall take precedence over terms and conditions contained in the General Conditions, as amended, and the terms and conditions in the General Conditions, as amended, shall take precedence over all other terms and conditions contained in the other Contract Documents. If the Request for Proposals and the Proposal are included in the Contract Documents, then the Request for Proposals shall take precedence over the Proposal, unless specifically agreed otherwise herein.

§ 1.3 The Board of Directors, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into or amend a contract, to approve changes in the scope of the Work, to approve and execute a Change Order or Construction Change Directive modifying the Contract Sum, or to agree to an extension to the date of Substantial or Final Completion. The Owner designates the following as the individual authorized to sign documents on behalf of the Board of Directors: Dr. Sandra Garza Ochoa, Superintendent of Schools, or Successor."

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

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, exceptas specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

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User Notes: (1381320808)

(Check one of the following boxes.)

[« »] The date of this Agreement.

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

[« X »] Established as follows:
(The first business day after the Owner's receipt and approval of the Contractor's required insurance documents.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« X »] Not later than « _____ » (« ____ ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
Alternate No. 1 (World Scholars Administration Area ductwork replacement), if accepted	[____] calendar days from the date of commencement of the Work

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

Final Completion shall be 30 calendar days after the date of Substantial Completion, subject to adjustments of this Contract Time as provided in the Contract Documents.

§ 3.4 LIQUIDATED DAMAGES

§ 3.4.1 Time is of the essence in all phases of the Work. It is specifically understood and agreed by and between Owner and Contractor that time is of the essence in the Substantial Completion and Final Completion of the Project and Owner shall sustain actual and direct damages as a result of Contractor's failure, neglect or refusal to achieve said deadlines. Such actual and direct damages are, and will continue to be, impracticable and extremely difficult to determine. Execution of this Agreement under these specifications shall constitute agreement by Owner and Contractor that the amounts stated below are the minimum value of the costs and actual and direct damages caused by failure of Contractor to complete the Work within the allotted or agreed extended times of Substantial or Final Completion, that such sums are liquidated direct damages and shall not be construed as a penalty, and that such sums may be deducted from payments due Contractor if such delay occurs. It is expressly understood that the said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not completed within the agreed time, or within the agreed extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty, said damages being caused by, but not limited to, additional compensation for personnel, attorneys fees,

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architectural fees, engineering fees, program management fees, inspection fees, storage costs, food service costs, transportation costs, utilities costs, costs of temporary facilities, loss of interest on money, and other miscellaneous increased costs, all of which are difficult to exactly ascertain. Failure to complete the Work within the designated or agreed extended dates of Substantial or Final Completion, shall be construed as a breach of this Agreement.

§ 3.4.2 It is expressly agreed as a part of the consideration inducing the Owner to execute this Agreement that the Owner may deduct from any Payment made to the Contractor a sum equal to $[_____] per day for each and every additional calendar day beyond the agreed date of Substantial Completion.

§ 3.4.3 Timely Final Completion is an essential condition of this Agreement. Contractor agrees to achieve Final Completion of the Agreement within 30 calendar days of the designated or extended date of Substantial Completion. Owner and Contractor agree that should Contractor fail to achieve Final Completion of the Agreement by the deadline, Owner shall continue to be damaged to a greater degree by such delay. Contractor and Owner agree that the amount of liquidated damages for each calendar day Final Completion is delayed beyond the date set for Final Completion shall be the sum of $[_____] per day. Owner may deduct from the Final Payment made to Contractor, or, if sufficient funds are not available, then Contractor shall pay Owner the amounts specified per day for each and every calendar day the breach continues after the deadline for Final Completion of the Work.

§ 3.4.4 Such damages shall be in addition to, and not in lieu of, any other rights or remedies Owner may have against Contractor for failure to timely achieve Final Completion, and damages for failure to achieve Substantial Completion and failure to achieve Final Completion may run concurrently. If the Work is not finally completed by the time stated in the Agreement, or as extended, no payments for Work completed beyond that time shall be made until the Project reaches Final Completion.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « [_____] Dollars and [____] Cents » ($ « [_____] »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
Alternate No. 1: World Scholars (Edinburg) Administration Area ductwork replacement, per RFCSP Attachment A	$[_____]

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
Allowances as specified in Division 1 of the Specifications	[as listed in Division 1]

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:

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(Insert terms and conditions for liquidated damages, if any.)

«Liquidated damages as set forth in Section 3.4: $[_____] per calendar day of delay in Substantial Completion and $[_____] per calendar day of delay in Final Completion. »

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

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

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

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum, less any unused Owner's contingency, among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;

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.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« 5% »

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.9 Except with the Owner's prior written approval or as otherwise provided in Section 9.3.2 of the AIA Document A201-2017, as amended the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

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

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

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

.3 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment. Undisputed amounts unpaid after the date on which payment is due shall bear interest pursuant to Texas Government Code Section 2251.025.

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

« » % « »

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ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

All disputes relating to this Agreement shall be resolved pursuant to the terms of Article 15 of the AIA Document A201-2017, as amended.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017 as amended.

« »

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« Frank Trevino, Construction Manager [confirm]
South Texas Independent School District
7001 E. Expressway 83
Mercedes, Texas 78570
Tel: (956) 514-4266; frank.trevino@stisd.net »
« »
« »
« »
« »
« »

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

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

« »

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§ 8.6 Other provisions:

§ 8.6.1 The Agreement shall be governed by the laws of the State of Texas, and any litigation shall be conducted in state district court. Mandatory and exclusive venue shall be in Hidalgo County, Texas, or, if no county is specified, then in the county in which the Owner's main administrative office is located.

§ 8.6.2 As a material consideration of the making of this Agreement, the modifications to this Agreement shall not be construed against the maker of said modifications.

§ 8.6.3 Notwithstanding anything to the contrary in this Agreement, or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

§ 8.6.4 Articles 1.5 and 1.6 of AIA Document A201-2017, as amended, shall govern Contractor's use of the Construction Documents.

§ 8.6.5 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractor's employees, subcontractors, and all other persons carrying out the Contract.

§ 8.6.6 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's full name in a typeface large enough to be seen from a reasonable distance.

§ 8.6.7 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to park their personal motor vehicles on Owner's property only in the parking places designated by the Owner's campus principal. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense.

§ 8.6.8 Contractor shall follow, and shall require all employees, agents or subcontractors to follow applicable ordinances of the municipality in which the Project is located. In addition, if not covered by the municipal tree ordinance, Contractor shall barricade and protect all trees on the Project.

§ 8.6.9 Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's subcontractor's forces' actions, omissions, or failure to secure the Work or adjoining property.

§ 8.6.10 The Contractor may not assign its responsibilities, duties, obligations and rights under this Agreement, without the express written consent of the Owner. This does not prevent Contractor from engaging subcontractors to perform various phases of the Project, but Contractor shall be fully responsible to Owner for the work, actions and omissions of all such subcontractors.

§ 8.6.11 This Agreement, in its entirety, shall be binding upon all the parties hereto, their respective successors, heirs, executors, administrators or assigns.

§ 8.6.12 Execution of this Agreement shall constitute approval and acceptance of all terms, covenants and conditions as modified and contained in the Contract Documents.

§ 8.6.13 This Agreement is subject to all applicable federal and state laws, rules, and regulations. Invalidity of any portion of this Agreement under the laws of the State of Texas or of the United States shall not affect the validity of the remainder of this Agreement.

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§ 8.6.14 By signing this Agreement, the undersigned certifies as follows: "Under Section 231.006, Texas Family Code, the vendor or applicant certifies that the individual or business entity named in the contract, bid, or application is not ineligible to receive the specified grant, loan, or payment and acknowledges that this contract may be terminated and payment may be withheld if this certification is inaccurate.

§ 8.6.15 Unless otherwise noted, terms in this Agreement shall have the same meaning as those in the edition of AIA Document A201-2017, General Conditions of the Contract for Construction, as amended for the Project.

§ 8.6.16 To the extent that any portion of the Work requires a trench excavation exceeding five (5) feet in depth, in accordance with Texas Health and Safety Code Section 756.023(a), Contractor shall fully comply, and shall require any applicable subcontractor to comply, with:

.1 The Occupational Safety and Health Administration standards for trench safety in effect for the construction of the Work;

.2 The special shoring requirements, if any, of the Owner; and

.3 Any geotechnical information obtained by Owner for use by the Contractor in the design of the trench safety system.

Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used. Said cost shall be included within the Contract Sum.

§ 8.6.17 No delay or omission by Owner in exercising any right or power accruing upon the noncompliance or failure of performance by Contractor of any of the provisions of this Agreement shall impair any such right or power or be construed to be a waiver thereof. A waiver by Owner of any of the covenants, conditions or agreements hereof to be performed by Contractor shall not be construed to be a waiver of any subsequent breach thereof or of any other covenant, condition or agreement herein contained.

§ 8.6.18 Contractor stipulates that Owner is a political subdivision of the State of Texas, and as such, enjoys immunities from suit and liability as provided by the Constitution and laws of the State of Texas. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically authorized by law.

8.6.19 **VERIFICATION OF NO BOYCOTT OF ISRAEL.** Pursuant to Texas Government Code 2271.002, Contractor asserts by signing this agreement that it is currently not boycotting Israel nor will it boycott Israel during the term of this agreement. Any such action to boycott Israel will be cause for immediate termination of this agreement.

8.6.20 **NO KNOWN CONTACTS WITH TERRORIST ORGANIZATIONS.** Pursuant to Sections 2252.151-.154 of the Texas Government Code, the Contractor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State under federal law.

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- **.1** AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor as amednded
- **.2** AIA Document A101™–2017, Exhibit A, Insurance and Bonds as amended
- **.3** AIA Document A201™–2017, General Conditions of the Contract for Construction as amended

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

« »

.5 Drawings

Number	Title	Date
Drawings prepared by Gomez Mendez Saenz, Inc.	[list sheet numbers and titles when the set is final]	July 31, 2026

.6 Specifications

Section	Title	Date	Pages
Project Manual and Specifications	Prepared by Gomez Mendez Saenz, Inc., HVAC Projects 2026-2027	July 31, 2026	[____]

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or competitive purchasing requirements are not part of the Contract Documents unless the bidding or competitive purchasing requirements are also enumerated in this Article 9.

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

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

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] The Project Manual, including Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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« Request for Competitive Sealed Proposals No. _____, HVAC Projects 2026-2027, dated _____, including all Addenda, which shall take precedence over the Proposal, unless specifically agreed otherwise herein.

Proposal signed by the Contractor, dated: _____. Prevailing Wage Rate Schedule (Hidalgo County and Cameron County), Appendix B to the Request for Competitive Sealed Proposals. »

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« Dr. Sandra Garza Ochoa »« , Superintendent of Schools, South Texas Independent School District »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

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APPENDIX A-2
AIA Document A201-2017 - General Conditions
of the Contract for Construction, as amended by Owner

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

HVAC Projects 2026-2027: Health Professions (Mercedes), Medical Professions (Olmito), and World Scholars (Edinburg), Texas

THE OWNER:
(Name, legal status and address)

South Texas Independent School District
7001 E. Expressway 83
Mercedes, Texas 78570

THE ARCHITECT:
(Name, legal status and address)

Gomez Mendez Saenz, Inc.
1150 Paredes Line Rd.
Brownsville, Texas 78521

TABLE OF ARTICLES

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2 OWNER

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6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement as amended between the Owner and Contractor (hereinafter the Agreement as amended) and consist of the Agreement as amended, Conditions of the Contract as amended General, Supplementary and other Conditions all sections of the Project Manual, including, Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect.

§ 1.1.1.1 The Agreement, as amended, represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. Any revision, amendment, or modification to the Standard Form of the Agreement shall be valid, binding, and enforceable only if signed by Contractor and the authorized representative of Owner's Board of Directors. In the event of conflict, terms and conditions contained in the Agreement, as amended, shall take precedence over terms and conditions contained in the General Conditions, as amended, and the terms and conditions in the General Conditions, as amended, shall take precedence over all other terms and conditions contained in the other Contract Documents. If the Request for Proposals and the Proposal are included in the Contract Documents, then the Request for Proposals shall take precedence over the Proposal, unless specifically agreed otherwise herein. Any reference to any Contract Document shall mean the document as amended and/or supplemented for this Project.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract as amended may be amended or modified only by a written Modification signed by Contractor, approved by Owner's Board of Directors, and signed by the representative of Owner's Board of Directors who is authorized to sign contracts. As a material consideration for the making of the Contract, modifications to the Contract shall not be construed against the maker of said modifications. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor.

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

§ 1.1.3 The Work

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

The Work includes all of Contractor's responsibilities as to all labor, parts, supplies, skill, supervision, transportation services, storage requirements, and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the Contract Documents and the Construction Documents and all other items of cost or value needed to produce, construct and fully complete the public Work identified by the Contract Documents and the Construction Documents. "Construction Documents" means: all Drawings, specifications, submittals, transmittals, deliverables, instructions to Contractors and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants and shall set forth in detail the requirements for construction of the Project. The Construction Documents shall include Drawings and Specifications that establish in detail the quality levels of materials and systems required for the Project. The Construction Documents shall reflect all agreements between Owner and Architect concerning Owner's budgetary constraints, programmatic needs and expectations as to quality, functionality of systems, maintenance costs, and usable life of equipment and facilities.

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Said Construction Documents shall reflect the Owner's educational program and educational specifications, the State educational adequacy standards in 19 TAC Section 61.1036 and the standards set forth in Section 2.1.4 of AIA Document B201-2017, as amended. The Architect shall provide Construction Documents which are sufficient for Owner to complete construction of the Project, and are free from material defects or omissions. The Construction Documents shall comply with all applicable laws, ordinances, codes, rules, and regulations, as of the date of issuance of construction documents.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 CONSTRUCTION DOCUMENTS

Construction Documents are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Construction Documents may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 PROJECT MANUAL

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

§ 1.1.9 PROJECT MANUAL ADDENDA

Project Manual Addenda are written or graphic instruments issued prior to the execution of the Contract, which modify or interpret the bidding or proposal documents, including Drawings and Specifications, by additions, deletions, clarifications, or corrections. Addenda will become part of the Contract Documents when the Agreement is executed. The Contractor and subcontractors shall include all addenda items on their copies of the Drawings and Specifications.

The following definitions apply to parties named in the Contract Documents:

Owner: South Texas Independent School District
7001 E. Expressway 83
Mercedes, Texas 78570
Tel: (956) 565-2454

Architect: Gomez Mendez Saenz, Inc.
1150 Paredes Line Rd.
Brownsville, Texas 78521

Contractor: [Contractor to be selected under RFCSP No. _____, HVAC Projects 2026-2027]
[Street address]
[City, State ZIP]

All references to "Contractor" shall include "Construction Manager at Risk" as appropriate.

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Program Manager:

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

§ 1.1.10 APPROVED, APPROVED EQUAL, APPROVED EQUIVALENTS, OR EQUAL

The terms "Approved" and "Approved Equal" relate to the substitution of materials, equipment, or procedure in writing by the Architect prior to receipt of bids.

§ 1.1.11 ABBREVIATIONS

AIA: American Institute of Architects
ACI: American Concrete Institute
AHERA: Asbestos Hazardous Emergency Response Act
AIEE: American Institute of Electrical Engineers
AISI: American Iron and Steel Institute
AISC: American Institute of Steel Construction
ANSI American National Standards Institute
ASA: American Standards Association
ASTM: American Society of Testing Materials
AWSC: American Welding Society Code
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
EPA: Environmental Protection Agency
FS: Federal Specification
NES: National Electrical Code
NIC: Not in Contract. Indicates work not to be done by this Contractor under this Agreement
OSHA: Occupational Safety and Health Administration
SPR: Simplified Practice Recommendation
TAS Texas Accessibility Standards
UL: Underwriters Laboratories, Inc.

§ 1.1.12 MISCELLANEOUS OTHER WORDS

§ 1.1.12.1 BUSINESS DAY

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

§ 1.1.12.2 CALENDAR DAY

A calendar day is a day on the Gregorian Calendar. The Contract Time is established in calendar days. Extensions of time granted, if any, will be converted to calendar days.

§ 1.1.12.3 HOLIDAYS

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Owner-approved holidays for Contractor's Work are limited to New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

§ 1.1.12.4 WORK DAY

Work days are all calendar days except Holidays.

§ 1.1.12.5 ANTICIPATED WEATHER DAYS

An allowance of regular Work Days, established as anticipated Work Days lost due to weather delays; said allowance shall be included in Contractor's proposed completion time. Only lost weather days in excess of Anticipated Weather Days shall be considered by Owner for time extensions based upon weather. Section 15.1.5.3 lists required Anticipated Weather Days.

§ 1.1.13 CONTRACT SUM

"Contract Sum" shall have the same meaning as in Section 5.1 of the Agreement (A133-2009), as amended for the Project, when the Project is a Construction Manager at Risk Project, and the same meaning as in Section 4.1 of the Agreement (A101-2017), as amended for the Project, otherwise.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 RELATION OF SPECIFICATIONS AND DRAWINGS

§ 1.2.4.1 General Requirements in the Specifications govern the execution of all Specifications. Summary paragraphs present a brief indication of the Work, but do not limit the Work as later detailed. The Drawings and Specifications are correlative and have equal authority and priority. Should the Drawings and Specifications have internal inconsistencies, then the Contractor shall base the bids and construction on the most expensive combination

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of quality and quantity of work indicated. For purposes of construction, the Architect shall determine the appropriate Work, after the Contractor brings the inconsistency to the Architect's attention. Failure to report an inconsistency shall be evidence that Contractor has elected to proceed in the more expensive manner.

§ 1.2.5 MATERIALS, EQUIPMENT AND PROCESSES

§ 1.2.5.1 Exact location and arrangement of the various pieces of equipment specified shall be determined with the approval of the Architect after equipment has been selected and/or as the Work progresses. All equipment shall, insofar as possible, be installed in such a manner as will not interfere with architectural or structural portions of the building. Should changes become necessary because of a failure of the Contractor to comply with the bidding instructions which results in equipment requiring area not shown on the Construction Documents, the Contractor shall be fully responsible for completing any required modifications or eliminating any interferences. Where in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are specified, it is done for the express purpose of establishing a standard of function, dimension, appearance, and quality of design in harmony with the Work, and is not intended for the purpose of limiting competition. Materials or equipment shall not be substituted unless the Architect has specifically accepted such substitution for use on this Project. When more than one material, process, or brand is specified for a particular item of Work, the choice shall be the Contractor's. The final selection of color and pattern will be made by the Owner from the range available within the option selected by the Contractor, unless the item is specified to match a specific color or sample furnished. Where particular items are specified, products of those named manufacturers are required unless Contractor submits for consideration proposed substitutions of materials, equipment or processes from those set out in the Contract Documents. Submittals of proposed substitutions should contain sufficient information to allow the Architect and Owner to determine if the proposed substitution is in fact equal to or better than the requirements in the Contract Documents. The Architect shall review and respond to proposed substitutions within fifteen (15) days of receipt. Contractor shall bear all risk caused by submitting substitutions, including all costs. The Owner may approve substitutions only when the substitution is clearly provided by the Contract to be equal in performance characteristics to the requirements of the Contractor Documents, equally compatible with the existing installations and complementary to the architectural design for the Work. Certain specified construction and equipment details may not be regularly included as part of the named manufacturer's standard catalog equipment, but shall be obtained by the Contractor from the manufacturer as required for the proper evaluation and/or functioning of the equipment. Reasonable minor variations in equipment are expected and will be acceptable, if approved by the Architect and Owner, however, indicated and specified performance and material requirements are the minimum. The Owner and the Architect reserve the right to determine the equality of equipment and materials that deviate from any of the indicated and specified requirements.

§ 1.2.6 STANDARDS AND REQUIREMENTS

§ 1.2.6.1 When the Contract Documents refer to standards, building codes, manufacturers' instructions, or other documents, unless otherwise specified, then the current edition as of the date of execution of the Agreement by the last party to execute said Agreement shall apply. It shall be the responsibility of the Architect to address revisions or amendments to applicable codes or standards which arise after the date of execution of the Agreement and until Final Completion, pursuant to the terms of the Agreement between Owner and Architect. Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement. These Contract Documents shall not be construed to deny or diminish the right of any person to work because of the person's membership or other relationship status with respect to any organization. Texas Government Code § 2269.054.

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§ 1.5 Ownership and Use of Drawings, Specifications, and CONSTRUCTION DOCUMENTS

§ 1.5.1 All ownership rights, whether common law, statutory, or other reserved rights, including copyright ownership of the Construction Documents, are controlled by the Agreement between the Owner and the Architect. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Construction Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are granted a limited license to use and reproduce the Construction Documents provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Construction Documents. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Construction Documents on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the copyright holder. All copies of the Construction Documents, except the Contractor's record set, shall be returned or suitably accounted for to the copyright holder upon completion of the Work.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Construction Documents or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the independent school district identified in the Contract Documents. The Board of Directors, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into or amend a contract, to approve changes in the scope of Work, to approve and execute a Change Order or Construction Change Directive modifying the Contract Sum or Guaranteed Maximum Price, or agree to an extension to the date of Substantial or Final Completion. The Board will act as soon as reasonably possible to avoid undue delays. The Board designates authorized representatives to act on its behalf for day-to-day operations under the Contract. Unless otherwise designated in the Contract Documents, Owner's authorized representative shall be the Superintendent of Schools, who may delegate responsibilities as appropriate. Owner's Board of Directors hereby delegates to the Superintendent of Schools or designee the authority to approve changes to the Work where such changes are within the Owner's contingency or the Contractor's contingency, and which do not exceed $50,000.00, or will not increase the dates for Substantial or Final Completion by more than thirty (30) days. Any such change shall be confirmed in writing between the Contractor and Owner's Superintendent or designee, and notice of such approved changes shall be given to the Board at its next regular meeting. Except as otherwise provided in the Contract Documents, the Architect does not have such authority. Neither Architect nor Contractor may rely upon the direction of any employee of Owner who has not been designated in writing by the Superintendent or Board of Directors; Owner shall not be financially responsible for actions taken by the Architect or Contractor in reliance upon direction from unauthorized persons.

§ 2.1.2 It shall be distinctly understood that by virtue of this Contract, no mechanic, contractor, material person, artisan, or laborer, skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the buildings or any of the improvements of whatsoever nature or kind so erected or to be erected by virtue of this Contract or upon any of the land on which said buildings or any of the improvements are so erected, built, or situated, such property belonging to a political subdivision of the State of Texas. It shall be further understood that this Contract is not written for the benefit of third parties.

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

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

§ 2.1.5 The Contractor stipulates and agrees that the Owner has no duty to discover any design errors or omissions in the Drawings, Plans, Specifications and other Construction Documents, and has no duty to notify Contractor of same. By entering into the Contract Documents or any Agreement with any Architect, Owner does not warrant the adequacy and accuracy of any Drawings, Plans, Specifications or other Construction Documents.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 The Owner, being a public body under the laws of the State of Texas, must have adequate funds and financing as provided by law prior to award and execution of the Contract Documents.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 If requested in writing by the Contractor prior to the start of the Work, the Owner shall furnish surveys known to the Owner the Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Other than the metes and bounds noted in the legal description of the site The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. Other than the metes and bounds noted in the survey, if any, Owner does not guarantee the accuracy of surveys provided, including the locations of utility lines, cables, pipes or pipelines, or the presence or absence of easements.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Construction Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Construction Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Construction Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a

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duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.The authorized Owner's representative having the legal right to stop the Work shall be limited to the Owner's Superintendent of Schools.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's and other consultant's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. and includes the Construction Manager at Risk, if applicable.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contruction Documents and submittals approved pursuant to section 3.12.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, activities of the Owner (or Owner's Program Manager, if applicable), or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this Contract, which representations and warranties shall survive the execution and delivery of the Contract and the Final Completion of the Work:

.1 that it is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents;

.2 that it is able to furnish the tools, materials, supplies, equipment and labor required to timely complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;

.3 that it is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental, public, and quasi-public authorities having jurisdiction over it, the Work, or the site of the Project; and

.4 that the execution of the Contract and its performance thereof are within its duly-authorized powers.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor represents and warrants by submission of a Proposal that he has carefully examined the Contract Documents, any soil test reports, drainage studies, geotechnical or other reports and the site of the Work, and that, from his own investigations, he has satisfied himself as to the nature and location of the Work, the character, quality and quantity of surface and subsurface materials

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likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, the general and local conditions and all other materials which may in any way affect the Work or its performance. Should the Contractor find discrepancies, omissions or conflicts within the Contract Documents, or be in doubt as to their meaning, the Contractor shall at once notify in writing the Architect and Owner, and Architect will issue a written addendum to all parties that is consistent with the Owner's Scope of the Work. The Contractor shall not be entitled to any additional time or compensation for Contractor's failure to visit the site, or for any additional Work caused by the Contractor's fault, by improper construction, or by Contractor's failure to visit the site or to carefully study and compare the Contract Documents prior to execution of the Work.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. Contractor shall not perform any Work involving an error, inconsistency, or omission without further instructions to Contractor or revised Construction Documents from the Architect.

§ 3.2.3 Neither the Owner not the Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the Work or to honor his warranty, or will result in a limitation of or interference with the Owner's intended use, then the Contractor shall promptly notify the Architect and Owner in writing, providing substantiation for his position. Any necessary changes, including substitution of materials, shall be accomplished by appropriate Modification. If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15 when the Contractor recognized or should have recognized such error, inconsistency, omission or difference and failed to report it to the Architect. Contractor shall not be entitled to additional compensation for additional Work caused by Contractor's failure to carefully study and compare the Construction Documents prior to the execution of the Work. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. Contractor shall take field measurements, verify field conditions, and shall carefully compare them to the Construction Documents. The Contractor shall be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 Prior to performing any Work, and only if applicable, Contractor shall locate all utility lines as shown and located on the plans and specifications, including telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, but not limited to, all buried pipelines and buried telephone cables, and shall perform any Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. In addition, Contractor shall independently determine the location of same. Contractor shall be responsible for any damage done to such utility lines, cables, pipes and pipelines during its Work, and shall be responsible for any loss, damage, or extra expense resulting from such damage. Repairs shall be made immediately to restore all service. Any delay for such break shall be attributable to Contractor. In addition, and only if applicable, Contractor shall review the appropriate AHERA and hazardous materials surveys for the particular campuses involved in the Project, and shall notify all Subcontractors and Sub-subcontractors of the necessity to review said surveys. Contractor shall perform any Work in such a manner as to avoid damaging, exposing, or dislodging any asbestos-containing

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materials that are clearly identified and located in AHERA and other hazardous material surveys. Before performing any portion of the Work, the Contractor shall fully investigate all physical aspects of the Project Site and verify all dimensions, measurements, property lines, grades and elevations, existing improvements, and general suitability of existing conditions at the Project site. If applicable, Contractor shall comply with U.S. Environmental Protection Agency rules concerning renovating, repairing or painting work in schools built prior to 1978 involving lead-based paint.

§ 3.2.6 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation. If, in the reasonable opinion of the Architect, the Contractor does not make reasonable effort to comply with any of the above requirements of the Contract Documents and this causes the Architect or his Consultants to expend an unreasonable amount of time in the discharge of the duties imposed by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure.

§ 3.2.7 The Contractor shall arrange meetings prior to commencement of the Work of all major Subcontractors to allow the Subcontractors to demonstrate an understanding of the Construction and Contract Documents to the Architect and to allow the Subcontractors to ask for interpretations, when necessary. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including:

.1 The location, condition, layout, drainage and nature of the Project site and surrounding areas;

.2 Generally prevailing climatic conditions;

.3 Anticipated labor supply and costs;

.4 Availability and cost of materials, tools and equipment; and

.5 Other similar issues.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractor's employees, subcontractors, and all other persons carrying out the Contract. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, while on Owner's property, to refrain from committing any criminal conduct, using tobacco products, possessing or drinking alcoholic beverages, possessing or using illegal drugs or any controlled substance, carrying or possessing weapons, speaking profane and/or offensive language, or engaging in any inappropriate interactions of any nature whatsoever with students and employees, including talking, touching, staring or otherwise contributing to a hostile or offensive environment for Owner's students and employees. All

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areas of campus, other than the defined construction area, shall be off limits to Contractor's forces, unless their work assignment specifies otherwise. Contractor shall also require adequate and appropriate dress and identification of Contractor's employees, subcontractors, and all other persons carrying out the Work. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's name in a typeface large enough to be seen from a reasonable distance. The Contractor shall further ensure that no on-site fraternization shall occur between personnel under the Contractor's and Subcontractor's direct or indirect supervision and Owner's students or employees and the general public. Failure of an individual to adhere to these standards of conduct shall result in the immediate removal of the offending employee from all construction on any of Owner's property. Repeated removal of Contractor's or Contractor's subcontractor's forces, or one serious infraction, shall constitute a substantial breach of the Agreement justifying the immediate termination by Owner pursuant to Article 14. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to park their personal motor vehicles on Owner's property only in the parking places designated by the Owner's campus principal. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense. Contractor shall follow, and shall require all employees, agents or subcontractors to follow, the tree ordinance of the municipality in which the Project is located. In addition, if not covered by the municipal tree ordinance, Contractor shall barricade and protect all trees on the Project, which shall be included in the Cost of the Work. Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's subcontractor's forces' actions, omissions, or failure to secure the Work or connecting or adjacent property.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall properly and efficiently coordinate the timing, scheduling and routing of all Work performed by all trades and sub-contractors.

§ 3.3.5 To the extent that any portion of the Work requires a trench excavation exceeding five (5) feet in depth, in accordance with Texas Health and Safety Code Section 756.023(a), Contractor shall fully comply, and shall require any applicable subcontractor to comply, with:

.1 The Occupational Safety and Health Administration standards for trench safety in effect for the Construction of the Work;

.2 The special shoring requirements, if any, of the Owner; and

.3 Any geotechnical information obtained by Owner for use by the Contractor in the design of the trench safety system.

.4 Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used.

§ 3.3.6 The Contractor shall review Subcontractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person or entity (e.g., a supplier), including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state, and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Paragraph are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws, including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration.

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§ 3.3.7 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent contractor. Nothing contained in this Agreement or inferable from this Agreement shall be deemed or construed to: 1) make Contractor the agent, servant or employee of the Owner; or 2) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner or any of its authorized representatives in respect of the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent contractor status.

§ 3.3.8 Pursuant to Texas Labor Code Sec. 214.008, the Contractor and any subcontractor on the Project shall properly classify, as an employee or an independent contractor, in accordance with Texas Labor Code Chapter 201, any individual the Contractor or subcontractor directly retains and compensates for services performed in connection with this Agreement. Any Contractor or subcontractor who fails to properly classify such an individual may be subject to the penalties of Texas Labor Code Sec. 214.008(c).

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Contractor shall appropriately classify all workers in accordance with the Fair Labor Standards Act, its implementing regulations, and Texas Labor Code Section 214.008.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the prior written consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.4.2.2 The Contractor must submit to the Architect and the Owner: (i) a full explanation of the proposed substitution and submittals of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation for the substitution; (ii) a written explanation of the reasons the substitution should be considered, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum; (iv) the adjustment, if any, in the time of completion of the Contract and the construction schedule; and (v) an affidavit stating (a) the proposed substitution conforms to and meets all requirements of the pertinent Specifications and the requirements shown on the Drawings, and (b) the Contractor accepts the warranty and will coordinate the Work to be complete in all respects, as if originally specified by the Architect. Proposals for substitutions shall be submitted in triplicate to the Architect in sufficient time to allow the Architect no less than fifteen (15) working days for review. No substitutions will be considered or allowed without the Contractor's submittals of complete substantiating data and information.

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

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. THE CONTRACTOR RELEASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES, CONTRACTOR'S FORCES' NON-COMPLIANCE WITH CRIMINAL LAW, OR CONTRACTOR'S OR

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CONTRACTOR'S FORCES' NON-COMPLIANCE WITH IMMIGRATION LAW OR REGULATIONS. Any individual found by Owner to have violated these restrictions is subject to permanent removal from the Project, at Owner's request. Contractor shall place similar language in its subcontract agreements, requiring its Subcontractors and Sub-subcontractors to be responsible for their own forces and Contractor shall cooperate with the Owner to ensure Subcontractor and Sub-subcontractor compliance.

§ 3.4.4 Including, but not limited to, the specific requirements of Section 10.1.1, Contractor, its subcontractors and vendors shall bear responsibility for compliance with all federal and state laws, regulations, guidelines, and ordinances pertaining to worker safety and applicable to the Work. Contractor further recognizes that the Owner and Architect do not owe the Contractor any duty to supervise or direct his work so as to protect the Contractor from the consequences of his own conduct.

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

§ 3.4.6 CRIMINAL HISTORY CHECKS

§ 3.4.6.1 Contractor shall obtain all criminal history information required by Texas Education Code Chapter 22 regarding its "covered employees", as defined below. If Contractor is required by Chapter 22 to obtain the information from the Fingerprint-based Applicant Clearinghouse of Texas, then Contractor will also subscribe to that person's criminal history record information. Before beginning any Work on the Project, Contractor will provide written certification to the District that Contractor has complied with the statutory requirements as of that date. Upon request by Owner, Contractor will provide, in writing: updated certifications and the names and any other requested information regarding covered employees, so that the Owner may obtain criminal history record information on the covered employees. Contractor shall assume all expenses associated with obtaining criminal history record information.

§ 3.4.6.2 Contractor will not assign any "covered employee" with a "disqualifying criminal history", as those terms are defined below, to work on the Project. If Contractor receives information that a covered employee has a reported disqualifying criminal history, then Contractor will immediately remove the covered employee from the Project and notify the Owner in writing within three business days. If the Owner objects to the assignment of any covered employee on the basis of the covered employee's criminal history record information, then Contractor agrees to discontinue using that covered employee to provide services on Owner's Project. If Contractor has taken precautions or imposed conditions to ensure that the employees of Contractor and any subcontractor will not become covered employees, Contractor will ensure that these precautions or conditions continue throughout the time the contracted services are provided.

§ 3.4.6.3 For the purposes of this Section, "covered employees" means employees, agents or subcontractors of Contractor who has or will have continuing duties related to the services to be performed on Owner's Project and has or will have direct contact with Owner's students. The Owner will decide what constitutes direct contact with Owner's students. "Disqualifying criminal history" means any conviction or other criminal history information designated by the Owner, or one of the following offenses, if at the time of the offense, the victim was under 18 years of age or enrolled in a public school: a felony offense under Texas Penal Code Title 5 Offenses Against Persons; an offense for which a defendant is required to register as a sex offender under Texas Code of Criminal Procedure Chapter 62; or an equivalent offense under federal law or the laws of another state."

§ 3.4.6.4 Subcontractors or any subcontractor entity, as defined by Texas Education Code § 22.0834(p)(2), shall be required by the terms of their contract with Contractor or any other contracting entity (as defined in Texas Education Code §22.0834(p)(1)), and by Texas law, to obtain the required criminal history record information on their employees, agents, or applicants, to give required certifications to Owner and the contracting entities, and to obtain required certifications from the subcontracting entity's subcontractors.

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§ 3.4.6.5 On request of Owner, Contractor shall provide all necessary identifying information to allow Owner to obtain criminal history record information for covered employees of the Contractor and all subcontractors. Contractor shall update this list on Owner's request.

§ 3.4.7 OWNER'S ADDITIONAL REQUIREMENTS RELATED TO CRIMINAL HISTORIES

§ 3.4.7.1 In addition, Contractor will at least annually obtain criminal history record information that relates to any employee, agent, or subcontractor of the Contractor or a Subcontractor, if the person has or will have duties related to the Project, and the duties are or will be performed on Owner's Project, or at another location where students are likely to be present. Contractor shall assume all expenses associated with the background checks and shall immediately remove any employee, agent or subcontractor who was convicted of a felony or a misdemeanor involving moral turpitude from Owner's property, or other location where students are likely to be present. Owner shall determine what constitutes "moral turpitude" or a "location where students are likely to be present.

§ 3.4.8 PREVAILING WAGE RATES

§ 3.4.8.1 Contractor, Contractor's Subcontractors and Sub-subcontractors shall pay all workers not less than the general prevailing rate of per diem wages for work of a similar character where the Project is located, as detailed in the "Minimum Wage Schedule" provided herein. Wages listed are minimum rates only. However, no claims for additional compensation above the Contract Sum shall be considered by the Owner because of payments of wage rates in excess of the applicable rate provided herein. Texas Government Code Section 2258 et seq.; Texas Labor Code Section 62.051 et seq.

§ 3.4.8.2 Contractor shall forfeit, as a penalty to the Owner, $60 for each laborer, worker or mechanic employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the Contract Documents.

§ 3.4.8.3 Owner reserves the right to receive and review payroll records, payment records, and earning statements of employees of Contractor, and of Contractor's Subcontractors and Sub-subcontractors.

§ 3.4.8.4 In executing the Work under the Contract Documents, Contractor shall comply with all applicable state and federal laws, including but not limited to, laws concerned with labor, equal employment opportunity, safety and minimum wages.

§ 3.4.8.5 Prevailing Wage Rates: [attach Schedule as Exhibit ___]. If no schedule is attached, then the parties shall use the wage rate determined by the US Department of Labor in accordance with the Davis-Bacon Act, 40 USC Section 276a, which can be accessed on the internet at www.gpo.gov/davisbacon/, or determined by any local contractor association, whichever is less."

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that Contractor shall perform the Work in a good and workmanlike manner, continuously and diligently in accordance with generally accepted standards of construction practice for construction of projects similar to the Project, except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship, in which case the standard shall be the higher standard. All material shall be installed in a true and straight alignment, level and plumb; patterns shall be uniform; and jointing of materials shall be flush and level, unless otherwise directed in writing by the Architect. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, (unless such maintenance is Contractor's responsibility) improper operation, or normal wear and tear and normal usage, but such exclusions shall only apply after Owner has taken occupancy of the damaged or defective portion of the Project. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality

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of materials and equipment. Notwithstanding anything in the Contract Documents to the contrary, Owner and Contractor expressly agree that the warranties stated herein shall mean the individual warranties associated with each particular Work within the Project, and each such individual warranty shall run from the applicable Work's Final Completion date (unless otherwise expressly provided in the applicable Contract Documents for that particular Work). Contractor's express warranty is in addition to, and not in lieu of, Owner's other available remedies. All required warranties on equipment, machinery, materials, or components shall be submitted to the Architect on the manufacturer's or supplier's approved forms for delivery to the Owner. The warranties set out in this Subparagraph are not exclusive of any other warranties or guarantees set out in other places in the Contract Documents or expressed or implied under applicable law.

§ 3.5.2 Contractor shall certify that the Project has been constructed in general conformance with the Architect's or Engineer's plans, specifications, and Construction Documents, as modified from time to time pursuant to the terms of the Contract Documents. Contractor shall fully complete a "Certification of Project Completion" as required by 19 Texas Administrative Code Section 61.1036(c)(3)(F).

§ 3.5.3 In the event of failure of materials, products, or workmanship, either during construction or the warranty period, the Contractor shall take appropriate measures to ensure correction of defective Work or replacement of the defective items, without cost to the Owner. Such warranty shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the Project. Upon written notice from the Owner or Architect, the Contractor shall promptly remedy defects as covered by Contractor's warranty. If Contractor does not respond to the written notice, either by beginning corrective work or notifying Owner in writing regarding when corrective work will begin, within ten days of Contractor's receipt of the written notice, then the Owner may take measures to correct the Work and Contractor will be obligated to reimburse Owner's costs. The provisions of this subparagraph shall be in addition to, and not in lieu of, any other rights and remedies available to the Owner.

§ 3.5.4 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of:

.1 an affidavit from the manufacturer certifying that the item is in conformance with the applicable standards; or

.2 an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standards; or

.3 such further reasonable proof as is required by the Architect.

§ 3.5.5 The Contractor agrees to assign to the Owner at Final Completion of the Work, such assignment to be effective no later than Final Completion, any and all manufacturers' warranties relating to materials and labor used in the Work. Contractor further agrees to perform the Work in such manner so as to preserve any and all such manufacturers' warranties. All forms will be required to be submitted prior to Final Payment.

§ 3.5.6 The warranties of Contractor provided in Subparagraphs 3.5.1, 3.5.2, and 3.5.3 shall in no way limit or abridge the warranties of the suppliers of equipment and systems which are to comprise a portion of the Work and all such warranties shall be in form and substance as required by the Contract Documents. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations.

§3.5.7 Contractor shall maintain a complete and accurate schedule of the date(s) of Substantial Completion, the date(s) of Final Completion, and the dates upon which the warranty under section 12.2.2.1 herein on each phase or building will expire. Contractor shall provide a copy of such schedules to Owner and Architect. Prior to termination of the warranty period under Section 12.2.2.1 herein, Contractor shall accompany Owner and Architect on re-

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inspection of each Work in the Project and Contractor shall be responsible for correcting any warranty items which are observed or reported during the warranty period under Section 12.2.2.1 herein. Contractor shall prosecute such warranty work under Section 12.2.2.1 herein without interruption until accepted by Owner and Architect, even though such work should extend beyond the warranty period under Section 12.2.2.1 herein. If Contractor fails to provide the schedules to Owner and Architect, Contractor's warranty obligation described herein shall continue until such inspection is conducted and deficiencies are corrected.

§ 3.5.8 Prior to receipt of Final Payment, Contractor shall:

.1 Obtain duplicate original warranties, executed by all subcontractors, making the dates of beginning of the warranties the Date of Final Completion; and the warranties of suppliers and manufacturers, making the dates of beginning of the warranties no later than the Date of Final Completion;

.2 Verify that the documents are in proper form and contain full information;

.3 Co-sign warranties when required;

.4 Bind all warranties in commercial quality 8-1/2 X 11 inch three-ring binder, with hardback, cleanable, plastic covers;

.5 Label the cover of each binder with a typed or printed title labeled "WARRANTIES", along with the title of the Project; name, address and telephone number of Contractor; and name of its responsible principal;

.6 Include a Table of Contents, with each item identified by the number and title of the specification section under which the product is specified; and

.7 Separate each warranty with index tab sheets keyed to the Table of Contents listing.

.8 Deliver warranties and bonds in the form described above, to the Architect who will review same prior to submission to the Owner.

§ 3.5.9 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

§ 3.6.1 Owner is an exempt entity under the tax laws of the State of Texas. Texas Tax Code § 151.309; 34 TAC § 3.322. The Owner represents that this Project is eligible for exemption from the State Sales Tax on tangible personal property and material incorporated in the Project, provided that the Contractor fulfills the requirements of the Texas Tax Code § 151.309, § 151.310, § 151.311 and 34 TAC § 3.291; 3.287. For the purpose of establishing exemption, it is understood and agreed that the Contractor may be required to segregate materials and labor costs at the time a Contract is awarded. Contractor will accept a Certificate of Exemption from the Owner, pursuant to Texas Tax Code § 151.054(e); § 151.155; and 34 TAC § 3.287. Contractor shall obtain Certificates of Resale from Contractor's suppliers. Texas Tax Code § 151.154, 34 TAC § 3.285. Failure of Contractor or any Sub-Contractor to obtain Certificates of Resale from their suppliers shall make the Contractor or Sub-Contractor responsible for absorbing the tax, without compensation from Owner. Contractor shall pay all necessary local, county and state taxes, income tax, compensation tax, social security and withholding payments as required by law. CONTRACTOR HEREBY RELEASES, INDEMNIFIES, AND HOLDS HARMLESS OWNER FROM ANY AND ALL CLAIMS AND DEMANDS MADE AS A RESULT OF THE FAILURE OF CONTRACTOR OR ANY SUBCONTRACTOR TO COMPLY WITH THE PROVISIONS OF ANY OR ALL SUCH LAWS AND REGULATIONS.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 After Architect has filed the plans and specifications with the Texas Department of Licensing and Regulation, Architect shall notify Contractor that Contractor may make and submit the applications for the building permit. Unless otherwise provided in the Contract Documents, the Contrator shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and

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completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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

§ 3.7.1.2 The Contractor shall pay directly all temporary utility charges, tap charges, and water meter charges, without reimbursement from Owner. After consultation with the Owner, the Contractor shall also obtain all permits and approvals, and pay all fees and expenses, if any, associated with National Pollutant Discharge Elimination System (NPDES) regulations administered by the Environmental Protection Agency (EPA) and local authorities, if applicable, that require completion of documentation and/or acquisition of a "Land Disturbing Activities Permit" for the Project. Also after consultation with the Owner, the Contractor shall obtain all permits and approvals, and pay all fees and expenses, if any, associated with Storm Water Pollution Prevention and Pollution Control Plan (SWPPP) regulations administered by the Texas Commission on Environmental Quality (TCEQ) and local authorities. Contractor's obligations under this Section may or may not require it to obtain or perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites. Any drainage alterations made by Contractor during the construction process, which require the issuance of a permit, shall be at Contractor's sole cost. Reimbursable expenses shall not include any fines or penalties assessed against the Contractor, Contractor's subcontractors, the Project, or the Owner.

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

§ 3.7.3 If the Contractor performs Work when Contractor knows or reasonably should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, the Contract Documents, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than three (3) business 21 days after first observance of the conditions. Contractor agrees that this is a reasonable notice requirements. The Architect will promptly investigate such conditions and, report findings and a recommended resolution in writing to Owner and Contractor. If Owner's Board of Directors and Contractor cannot agree on an equitable adjustment to the Contract Sum or Contract time, then either party may pursue alternative dispute resolution as provided for in Article 15 within ninety (90) days of the Architect's recommendation

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers,archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the

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Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of services to the Project. The Contractor shall inform the Architect at once when the Owner's participation is required, and the Architect shall immediately notify the Owner. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work, whether the Work is new construction or renovation of an existing facility, are the responsibility of the Contractor unless otherwise agreed. If the Work is new construction, then payment for temporary and/or permanent utility services shall be the responsibility of the Contractor until Substantial Completion.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection, unless required to do so by the terms of the construction Documents.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum, or the Owner's Contingency, at Owner's discretion, shall be adjusted accordingly. The amount of the adjustmentshall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.8.4 When performing Work under allowances, Contractor shall solicit and receive not less than three written proposals and shall provide the Work as directed by the Architect, upon Owner's written approval, on the basis of the best value to the District.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during performance of the Work. In addition, the Contractor may employ a project manager and necessary assistants who may supervise several Project sites. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be similarly confirmed in writing. Other communications shall be similarly confirmed on written request in each case. Questions about plan interpretation or directions shall be submitted to the Architect in the form of a written request for information and the Architect shall respond to such request for information in a reasonable and timely fashion. Contractor's selection of project manager or superintendent(s) shall be approved by Owner, and Contractor shall not replace the project manager or superintendent(s) without Owner's consent or until a replacement project manager or superintendent(s) has been selected in accordance with this Section. The Owner may reject or require removal of any job superintendent, project manager or employee of the Contractor, Subcontractor or Sub-Subcontractor involved in the Project. Contractor shall provide an adequate staff for the proper coordination and expedition of the Work. Owner reserves the right to require Contractor to dismiss from the Work any employee or employees that Owner may deem incompetent, careless, insubordinate, or in violation of any provision in these Contract Documents. This provision is applicable to Subcontractors, Sub-Subcontractors and their employees.

§ 3.9.2 Contractor's superintendent shall be present full-time on the site as soon as possible after commencement of the Work, and shall remain assigned to this Work, and present on the site, throughout the course of the Work until items requiring completion or correction, identified at Substantial Completion pursuant to Paragraph 9.8, have been

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completed or corrected. From Substantial Completion until Final Completion, the superintendent shall be on the site as necessary to ensure that Final Completion occurs within 30 days of Substantial Completion.

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

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

§ 3.9.5 Questions about plan interpretation or directions shall be submitted by Contractor's superintendent to the Architect in the form of a written request for information and the Architect shall respond to such request for information in a reasonable and timely fashion.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The schedule shall not interfere with the operation of Owner's existing facilities and operations without Owner's prior written approval.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The Contractor shall hold weekly progress meetings at the Project Site, or at such other time and frequency as are acceptable to the Owner. Progress of the work shall be reported at said meetings with reference to Contractor's construction schedule. The Contractor shall submit to the Architect with each monthly application for payment a copy of the progress schedule showing all modifications required and shall take whatever corrective action is necessary to assure that the project completion schedule is met at no additional cost to Owner, except as allowed herein. In the event that Contractor shall fall behind schedule at any time, Contractor shall develop and deliver a recovery plan to the Owner with a recovery schedule and a program describing the additional manpower, overtime, material expediting, resequencing of the Work and other steps Contractor shall take to meet the requirements of the Contract. Contractor shall not be entitled to compensation from the Owner or any increase in the Contract Sum for the schedule recovery efforts. No approval or consent by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor shall constitute a waiver by Owner of any damages or losses which Owner may suffer by reason of such resequencing or the failure of Contractor to meet the Substantial Completion Date or the Final Completion Date.

§ 3.11 Documents and Samples at the Site

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§ 3.11.1 The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, field test records, inspection certificates or records, manufactures' certificates, Product Data, Samples and similar required submittals. These shall be available to the Architect and Owner at all times and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.2 In addition to any other requirement in the Contract Documents and prior to installation, Contractor shall furnish or cause a subcontractor to furnish, for the Owner's and Architect's written approval, a physical sample of each specified item, product, fixture or device which is visible by the general public and/or attached to an architecturally-finished surface. Samples shall be suitably labeled, adequately protected and properly stored at the site. Samples which are approved and undamaged will be considered to be suitable for incorporation into the Work.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and verified that the information contained within such submittals complies with the requirements of the Work and of the Contract Documents. Specific dimensions, quantities, installation and performance of equipment and systems in compliance with the Construction Documents and the Contract Documents remain the Contractor's responsibility.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof, except for any such errors or omissions which are within Architect's statutory or contractual design responsibility.

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§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Unless the Contractor is providing professional services as allowed herein the Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents. A registered architect must prepare plans and specifications for all the Work, as governed by the Texas Occupations Code Chapter 1051; and a registered engineer must prepare plans, specifications and estimates for all Work governed by Texas Occupations Code Chapter 1001. In the event that Contractor retains a licensed design professional under the terms of this paragraph, Contractor shall require that the licensed design professional carry commercial general liability and errors and omissions insurance coverage in the same amounts and forms as required of the Architect on this Project. In the event that the licensed design professional retained by the Contractor will be conducting on-site services or observations, the licensed design professional shall also carry worker's compensation insurance and comprehensive automobile liability in the same amounts and forms as required of the Architect on this Project.

§ 3.12.11 The Contractor shall submit complete drawings, data and samples to the Architect at least fifteen (15) days prior to the date the Contractor needs the reviewed submittals and samples returned. The Contractor shall be prepared to submit color samples on any key items (such as quarry tile, vinyl wall covering, etc.) within fifteen (15) days of the award of Subcontract(s). All color samples required for the Work shall be received within sixty (60) days of the date of the approval of the Contract Sum if the Project is an A101 project, or Guaranteed Maximum Price if the Project is an A133 project. Once samples of all key items are received, the Architect will finalize color selections.

§ 3.12.12 The Contractor shall submit the number of copies of product data and samples which the Contractor and subcontractors need for their use, plus two additional sets for the Architect, one additional set for the Owner and one additional set for each of the Architect's consultants involved with the particular section of Work. Where shop drawings are involved, the Contractor shall submit one high quality reproducible transparency and one opaque print of the shop drawing for the Architect, plus one additional opaque print for each of the Architect's consultants involved with the particular section of Work. The reproducible transparency will be marked by the Architect and/or his consultants. After final review and correction of the submittal, the Contractor shall send one corrected set to the Architect and each of the Architect's consultants involved with the particular section of Work.

§ 3.12.13 The Architect's review of Contractor's submittals shall be limited to examination of an initial submittal and one (1) re-submittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to reimbursement from the Contractor of amounts paid to the Architect for evaluation of such additional re-submittals.

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§ 3.12.14 The Contractor represents and warrants that all shop drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the shop drawings are prepared and, if required by the Architect or applicable law, by a licensed engineer.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

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

§ 3.13.3 The Contractor and its subcontractors shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords Owner reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed in such a manner that public areas adjacent to the Site of the Work shall be free from all debris, building material and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Construction Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of any area or building adjacent to the site of the Work, or the building, in the event of partial occupancy.

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

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, provided, however, that any such cutting, fitting or patching can only be performed if the cutting, fitting or patching results in Work that is in accordance with the Construction Documents and Contract Documents. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.14.3 No cutting of structural elements will be permitted unless specifically approved in writing by Architect. Fitting and patching shall only be done with new products, and shall only performed by those skilled in performing the original Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor on a daily basis shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall provide on-site containers for the collection of waste materials, debris and rubbish, and shall periodically remove waste materials, debris and rubbish from the Work and dispose of all such materials at legal disposal areas away from the site. All cleaning operations shall be scheduled so as to ensure that contaminants resulting from the cleaning process will not fall on newly-coated or newly-painted surfaces. At completion of the Work, the Contractor shall remove waste materials,

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rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. Immediately after unpacking materials, all packing case lumber or other packing materials, wrapping or other like flammable waste shall be collected and removed from the building and premises. Care shall be taken by all workers not to mark, soil, or otherwise deface any finish. In the event that any finish becomes defaced in any way by mechanics or workers, the Contractor or any of his Subcontractors shall clean and restore such surfaces to their original condition.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

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

§ 3.15.4 After construction is complete, Contractor shall: (1) employ skilled workers for final cleaning; (2) remove grease, mastic adhesive, dust, dirt, stains, fingerprints, labels and other foreign materials from all sight-exposed interior and exterior surfaces; (3) wash and shine glazing and mirrors; (4) polish glossy surfaces to a clear shine; (5) vacuum clean carpeted and similar soft surfaces; (6) clean (damp mop with clean mop and water) resilient and hard surface floors repeating as necessary until no visible residue remains on floors; (7) clean plumbing fixtures to a sanitary condition; (8) clean surfaces of all equipment and remove excess lubrication; (9) clean permanent filters and replace disposable filters in ventilating systems if units were operated during construction and clean ducts, blowers and coils; (10) clean light fixtures; (11) remove waste, foreign matter and debris from roofs, gutters, area ways and drainage ways; (12) remove waste, debris and surplus materials from the site; (13) remove stains, spills and foreign substances from paved areas; and (14) broom clean exterior concrete and paved surfaces and rake clean the grounds.

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall WAIVE AND RELEASE CLAIMS AGAINST THE OWNER AND ARCHITECT, AND SHALL INDEMNIFY AND hold HARMLESS the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect AND SHALL NOT BE RESPONSIBLE TO OWNER IF OWNER REQUIRES A PARTICULAR DESIGN, PROCESS OR PRODUCT THAT CONSTITUTES A COPYRIGHT VIOLATION . However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Owner and Architect in writing.

§ 3.18 Indemnification

§ 3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL WAIVE AND RELEASE CLAIMS AGAINST AND SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER, ARCHITECT, OWNER'S TRUSTEES, ARCHITECT'S CONSULTANTS, OWNER'S CONSULTANTS AND OFFICERS, AGENTS AND EMPLOYEES OF ANY OF THEM, FROM AND AGAINST CLAIMS, DAMAGES, LOSSES, CAUSES OF ACTION, SUITS, JUDGMENTS AND EXPENSES, INCLUDING BUT NOT LIMITED TO ATTORNEYS' FEES, ARISING OUT OF OR RESULTING FROM PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS OR EXPENSE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (INCLUDING THE WORK ITSELF) INCLUDING LOSS OF USE RESULTING THEREFROM, BUT ONLY TO THE EXTENT CAUSED IN WHOLE OR IN PART BY WILLFUL OR NEGLIGENT ACTS OR

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OMISSIONS OF THE CONTRACTOR, A SUB-CONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, ANYONE THEY CONTROL OR EXERCISE CONTROL OVER, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS OR EXPENSE IS CAUSED IN PART BY ANY WILLFUL OR NEGLIGENT ACTS OR OMISSIONS OF OWNER OR OWNER'S CONSULTANTS OR OTHER INDEMNIFIED PARTIES. SUCH OBLIGATION SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE, OR REDUCE OTHER RIGHTS OR OBLIGATIONS OF INDEMNITY THAT WOULD OTHERWISE EXIST AS TO A PARTY OR PERSON DESCRIBED IN THIS SECTION 3.18. ALL COSTS AND EXPENSES SO INCURRED BY ANY OF THE INDEMNIFIED PARTIES IN THAT EVENT SHALL BE REIMBURSED BY CONTRACTOR TO THE INDEMNIFIED PARTIES, AND ANY COST AND EXPENSES SO INCURRED BY INDEMNIFIED PARTIES SHALL BEAR INTEREST UNTIL REIMBURSED BY CONTRACTOR, AT THE RATE OF INTEREST PROVIDED TO BE PAID BY THE JUDGMENT UNDER THE LAWS OF THE STATE OF TEXAS.

§ 3.18.2 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER THIS SECTION 3.18 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

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

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

§ 3.18.5 THE PROVISIONS OF SECTION 3.18 IN ITS ENTIRETY SHALL SURVIVE THE COMPLETION, TERMINATION OR EXPIRATION OF THIS CONTRACT.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a new architect a whose status under the Contract Documents shall be that of the Architect. Owner shall notify Contractor if a new Architect has been employed by Owner.

§ 4.1.4 Except as expressly provided herein, the Contractor shall not be relieved of Contractor's obligation to perform the Work in strict accordance with the Construction Documents and the Contract Documents by the duties, responsibilities, or activities of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract Documents and will be an Owner's representative during construction, until final payment is due, and, with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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

§ 4.2.3 The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect, or request of the Contractor.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. However, Owner reserves the right to communicate directly with the Contractor and Subcontractors. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers

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shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 As further provided in the Contract Documents based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect shall reject Work that does not conform to the Construction Documents and Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will recommend to Owner additional inspection or testing of the Work in accordance with provisions of the Contract Documents whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Owner to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work. Architect and/or Contractor shall promptly notify, orally and in writing, the other party and Owner of any fault or defect in the Project or nonconformance with Construction Documents or the Contract Documents they may respectively discover and each, upon discovery of the defect or nonconformance, shall be responsible for notifying the other party and Owner of those corrective actions they respectively take; provided, however, Contractor shall have no duty to notify Owner of discoveries made or actions taken by Architect. Testing or inspections required by this subparagraph shall be conducted subject to the requirements of Chapter 2269 of the Texas Government Code.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, for the purpose of checking for conformance with the Contract Documents and all applicable laws, statutes, codes and requirements applicable to Architect's design services. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor, or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is conducted for the purpose of determining the general accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation of equipment or systems. All of which remain the responsibility of the Contractor as required by the Construction Documents and the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. If any submittal does not comply with the requirements of the Construction Documents or the Contract Documents, then Architect shall require Contractor to come into compliance. The Architect shall promptly report in writing to the Contractor and Owner any errors, inconsistencies and omissions discovered by the Architect in the Shop Drawings, Product Data and Samples.

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

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§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and make recommendations concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations or recommendations of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and recommendations, the Architect will endeavor to secure faithful performance by both Owner and Contractor.

§ 4.2.13 The Owner's decisions on matters relating to aesthetic effect shall be final.

§ 4.2.14 The Architect will review and respond to requests for information about the Construction Documents and the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information at no additional cost to the Owner.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect shall notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection. All subcontractors shall be procured in accordance with Texas Education Code Chapter 44, Subchapter B, and Texas Government Code Chapter 2269, as applicable. A notice of no reasonable objection shall in no way relieve the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents. The Contractor shall be fully responsible for the performance of its subcontractors, including those recommended or approved by the Owner.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

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§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. When the parties agree on a proposed substitute Subcontractor or if the Owner requires use of a specific subcontractor, then the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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

§ 5.2.5 Each Contractor or subcontractor shall be required to completely familiarize itself with the plans and specifications, to visit the Work site to completely familiarize itself with existing conditions, and to conduct any other appropriate investigations, inspections or inquiries prior to submission of a bid or proposal. No increases in Contract Sums or Guaranteed Maximum Price shall be allowed for failure to so inspect or investigate

§ 5.3 Subcontractual Relations

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. The terms and conditions of the Contract Documents shall be incorporated by reference into each subcontract agreement, except as provided below. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Each subcontractor shall provide proof of insurance to Contractor consistent with the Contractor's insurance to Owner and in amount commensurate with the Work to be performed by the Subcontractor.

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

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

§ 5.4 Contingent Assignment of Subcontracts

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

- **.1** assignment is effective only after termination of the Contract byeither in accordance with Article 14 or abandonment of the Project by the Contractor and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor;
- **.2** Assignment is subject to the prior rights and obligations of the surety, if any, obligated under bonds relating to the Contract; and
- .3 The Subcontractor provides bonds as required by law of prime contractors and by Owner.

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When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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

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

§ 5.5 NOTICE OF SUBCONTRACTOR DEFAULT

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separat Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. The Owner reserves the right to perform other non-Project-related construction work, maintenance and repair work, and school program operations at the site and near the site during the time period of the Work.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3. Contractor shall cooperate with other separate contractors to ensure that the Work remains on schedule. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement between the Owner and Contractor. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.2 Contractor's Mutual Responsibility

§ 6.2.1 It shall be the responsibility of the Contractor to assist, review, and coordinate the scheduling of work performed by any of the Owner's separate contractors. In addition, the Contractor shall be responsible for coordinating and providing all construction administration necessary for the Work and the work of any of Owner's separate contractors. The Contractor shall afford the Owner and Separate Contractors reasonable site access and opportunity for introduction and storage or staging of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents. Contractor shall be responsible for coordination between Contractor's subcontractors and Owner's separate contractors. Contractor shall review Owner's contract with Owner's separate contractors and become familiar with the requirements and scope of services contained therein.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect and Owner of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results and shall promptly report in writing to the Architect and Owner if Owner's separate contractors fail in any way to timely perform their services or negatively impact Contractor's schedule or ability to perform the Work. Failure of the Contractor to notify the Architect and Owner in writing of apparent discrepancies or defects prior to proceeding with the Work

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shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction.

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

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

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

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completedconstruction or to property of the Owner or Separate Contractor as provided in Section 10.2.5. as amended.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Owner will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. A properly prepared written request for a change in the Work by Contractor shall be accompanied by sufficient supporting data and information to permit the Architect to make a recommendation to Owner.

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

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Constructin Documents and the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work. Contractor shall not make any claim for an adjustment to time, Contract Sum or Guaranteed Maximum Price due to: a change in the materials used; a change in the specified manner of constructing and/or installing the Work; or additional labor, services, or materials, beyond that actually required by the terms of the Construction Documents or the Contract Documents, unless made pursuant to a written order or directive from Owner authorizing Contractor to proceed with a Change in the Work. No claim for an adjustment to time, Contract Sum or Guaranteed Maximum Price shall be valid unless so ordered or directed.

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§ 7.1.4 The total Contractor mark-up for overhead, profit or fee for work performed by the Contractor's own forces shall not exceed 10% of the cost of the Change in the Work. The total Contractor mark-up for overhead, profit or fee for supervision of work performed by subcontractors' forces shall not exceed 4% of the cost of the Change in the Work. The total subcontractor mark-up for overhead, profit or fee for work performed by the subcontractor's forces shall not exceed 10% of the cost of the Change in the Work. In no event shall total mark-up for overhead, profit or fee in any work which involves a subcontractor or one or more sub-subcontractors, regardless of who performs the work, exceed 14% of the total cost of the Change in the Work.

"§ 7.1.5 Allowance balances may be used to fund changes in the Work. The Contractor will not be allowed an overhead, profit or fee mark-up when changes in the Work are funded by one of the Allowances.

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

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum or Guaranteed Maximum Price; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum or Guaranteed Maximum Price may include those listed in Section 7.3.3.

§ 7.2.3 Contractor stipulates that acceptance of a Change Order by the Contractor constitutes full accord and satisfaction for any and all Claims, whether direct or indirect, arising from the subject matter of the Change Order.

§ 7.2.4 In no event shall a single change, or the aggregate of all changes, result in the total costs, reimbursements and fees exceeding the Contract Sum or the Guaranteed Maximum Price, unless agreed to in writing by Owner prior to the commencement of such modified or changed Work.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum, or Guaranteed Maximum Price or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum or Guaranteed Maximum Price and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum or Guaranteed Maximum Price, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon (additional mark-ups for overhead, profit and fees will not be allowed);
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee, subject to the limitations of subparagraph 7.1.4; or
- **.4** As provided in Section 7.3.4 subject to the limitations of subparagraph 7.1.4.

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§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum or Guaranteed Maximum Price, then the adjustment shall be determined by the Architect on the basis of the amount by which the Contractor's direct costs have actually been increased over the direct cost of performing the Work without the Change in the Work. Direct costs shall be limited to the following:

.1 Actual Costs of labor, including applicable payroll taxes, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Actual Costs of materials, supplies, and equipment, including cost of transportation used in performing the change in the work;

.3 Actual Rental costs of machinery and equipment rented from third parties, exclusive of hand tools;

.4 Actual Costs of premiums for all bonds and insurance, and permit fees.

The Contractor shall keep and present, in such form as the Architect or Owner may prescribe, an itemized accounting of the items listed above, together with appropriate supporting documentation.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Guaranteed Maximum Price or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum or Guaranteed Maximum Price and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost plus the Contractor's allocated percent of profit and overhead as confirmed by the Architect.

§ 7.3.9 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

With prior written notice of the Owner's representative the Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or Guaranteed Maximum Price or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time. The Contractor shall carry out such written orders promptly. Minor changes in the Work shall not include changes that involve the outward appearance of the structure, color schemes, floor plans, building materials, landscaping, or mechanical equipment.

§ 7.4.2 Allowance balances may be used to fund changes in the Work. The Contractor will not be allowed an overhead, profit or fee mark-up when changes in the Work are funded by one of the Allowances.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Final Completion of the Work.

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§ 8.1.2 The date of commencement of the Work is the first business day after Contractor's receipt of the written Notice to Proceed. The Notice to Proceed shall not be issued by Architect until the Agreement (or Amendment Number 1, if Contractor is a Construction Manager at Risk) has been signed by the Contractor, approved by Owner's Board of Directors, signed by the Owner's authorized representative, and Owner and Architect have received, and approved as to form, all required payment and performance bonds and insurance, in compliance with Article 11. Issuance of the notice to proceed shall not relieve the Contractor of his responsibility to comply with Article 11.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8. The date of Final Completion is the date certified by the Architect in accordance with Paragraph 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than 30 days after the date of Substantial Completion.

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

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor stipulates that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) fire, governmental actions (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect and Owner determines, justify delay, then the Contract Time may be extended for such reasonable time as the Architect and Owner may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15 as amended.

§ 8.3.3 This Agreement does not permit the recovery of damages, including, without limitation, extended home office overhead expenses, general conditions or other consequential damages, by the Contractor for delay or disruption or for extensions of time due to bad weather or acts of God. Contractor agrees that the only possible compensation for any delay is an extension of time.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. In the event that the Project is a Construction Management at Risk Project, the Contract Sum shall not exceed the Guaranteed Maximum Price.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices may, by mutual written agreement be equitably adjusted.

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§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, or in the case of a Guaranteed Maximum Price, within 15 days after establishing the Guaranteed Maximum Price, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect,or Owner shall be used as a basis for reviewing the Contractor's Applications for Payment. The schedule of values shall be prepared in such a manner that each major item of work, whether done by Contractor's own forces or subcontracted, is shown as a single line item on AIA Documents G702 and G703, Application and Certificate for Payment. If the Contractor is a Construction Manager at Risk, then the Contractor's fee and general conditions shall be specifically shown, and AIA Documents G702Cmc and G703 shall be used.

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

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

.2 Contractor's costs for various construction items shall be detailed. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, paving, etc.

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

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

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

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

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage.

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

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

§ 9.3.1.3 Until Final Completion of the Work, the Owner shall withhold retainage as provided in the Contract Documents, except that Owner shall not pay amounts for which the Architect refuses to certify payment, or the Owner refuses to pay, as provided herein in Section 9.4.3 or 9.5, as amended. The retainage shall be paid with the Final Payment. (Note: if more than 5% is retained, under Texas law, then the retainage must be placed in an interest-bearing account, and the contractor must be paid the interest earned on the retainage upon completion of the Work. Texas Government Code Section 2252.032).

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§ 9.3.2 Payments will be made on the basis of invoices for specific materials or equipment incorporated in the Work and specific materials or equipment (1) suitably stored at the site or (2) suitably stored at some off-site location, provided the following conditions are met for off-site storage:

.1 The location must be agreed to, in writing, by the Owner and Surety.

.2 The location must be a bonded warehouse.

.3 The Contractor's Surety must agree, in writing, to the amounts included in each Application for Payment.

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the off-site storage area and reviewing the stored contents. Contractor acknowledges that Architect's time is an additional service and shall compensate Architect directly for same.

.5 Payment shall not include any charges for overhead or profit on stored materials.

.6 Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance (naming the Owner as insured and naming the specific materials or equipment stored and their location) and transportation to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment until the materials or equipment are delivered to Owner's site. Failure to follow these procedures shall result in nonpayment for storage of or insurance on stored materials and equipment. Failure to follow these procedures shall also result in nonpayment of materials and equipment until said materials and equipment are incorporated into the Work.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY THE CONTRACTOR, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.

§ 9.3.4 Contractor shall submit Applications for Payment in quadruplicate using AIA Documents G702 and G703 Application and Certificate of Payment (or G702CMa, if applicable) and Continuation Sheet. All blanks in the form must be completed and signatures of Contractor and Notary Public must be original on each form. Incomplete or inaccurate Applications for Payment shall be returned to the Contractor by the Architect for completion and/or correction. Owner shall have no responsibility for payment of same if the Application for Payment is incomplete or inaccurate.

§ 9.3.5 By signing each Application for Payment, the Contractor stipulates and certifies to the following: that the information presented is true, correct, accurate and complete; that the Contractor has made the necessary detailed examinations, audits and arithmetic verifications; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials and supplies identified in the Applications for Payment have been purchased, paid for and received; that the subcontractors have been paid as identified in the Applications for Payment or that Contractor has been invoiced for same; that he has made the necessary on-site inspections to confirm the accuracy of the Applications for Payment; that there are no known mechanics' or materialmens' liens outstanding at the date of this requisition; all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application; that, except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmens' liens on the Work; that the Payment Application includes only Work self-performed by Contractor or for which Contractor has been invoiced; and that releases from all Subcontractors and materialmen have been obtained in such form as to

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constitute an effective release of lien under the laws of the State of Texas covering all Work performed and for which payment has been made by the Owner to the Contractor. Contractor understands that documents submitted to Owner become government documents under the laws of the State of Texas. Contractor further understands that falsification of Contractor's Application for Payment may constitute a violation of the penal laws of the State of Texas, including, but not limited to, Texas Penal Code Sections 32.46, 37.09, and 37.10, and may justify termination of Contractor's Contract with Owner.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, return the Payment Application to the Contractor as provided in Section 9.3.4; certify, sign and issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. Architect's written reasons for withholding certification shall be construed as the notice required by Texas Government Code Section 2251.042 et seq.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, that, the Architect has observed the progress of the Work; determined that the Work has progressed to the point indicated, in the Architect's professional opinion determined the quality of the Work is in accordance with the Construction Documents and the Contract Documents and critically evaluated and certified that the amounts requested in the Application for Payment are valid and correct, in the Architect's professional opinion. The foregoing representations are subject to an evaluation of the Work for conformance with the Construction Documents and the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect and in writing to the Owner. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data unless requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum. Examinations, audits and verifications, if required by the Owner, will be performed by the Owner's accountants or other representatives of the Owner acting in the sole interest of the Owner.

§ 9.4.3 The issuance of a Certificate for Payment shall constitute a recommendation to the Owner regarding the amount to be paid. This recommendation is not binding on the Owner if Owner knows of other reasons under the Contract Documents why payment should be withheld.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;

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.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

.8. failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract time.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

Notwithstanding any provision contained within this Article, if the Work has not attained Substantial Completion or Final Completion by the required dates, subject to extensions of time allowed under these Conditions, then Architect may withhold any further Certificate for Payment to Contractor to the extent necessary to preserve sufficient funds to complete the construction of the Project and to cover liquidated damages. The Owner shall not be deemed in default by reason of withholding payment as provided for in Sections 9.3.4, 9.4.3, 9.5.1, or this Section.

§ 9.6 Progress Payments

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

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. In compliance with Texas Government Code Section 2251.022, the Contractor shall, within ten (10) days following receipt of payment from the Owner, pay all bills for labor and materials performed and furnished by others in connection with the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor shall include a provision in each of its subcontracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder, and if the Owner so requests, shall provide copies of such Subcontractor payments to the Owner. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, then the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner. This Section is subject to the provisions of Texas Business and Commerce Code Chapter 56.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an

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obligation to pay, or to see to the payment of money to, a Subcontractor or supplier. Action on the part of the Owner to require Contractor to pay a Subcontractor shall not impose any liability on Owner.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Payments received by the Contractor from the Owner for Work properly performed by Subcontractors, or materials properly provided by suppliers, shall be held in trust by the Contractor for the benefit of those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor. Texas Property Code § 162.001.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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

§ 9.7 Failure of Payment

§ 9.7.1 Pursuant to Texas Government Code Section 3251.051 Payment, or if the Owner does not pay the Contractor any payment certified by the Architect, which is undisputed, due and owing after the date the payment is due under the Contract Documents then the Contractor may, upon ten (10) additional days' notice to the Owner and Architect that payment has not been made and the Contractor intends to suspend performance for nonpayment, may, stop the Work until payment of the amount owing has been received. If the Owner provides written notice to the Contractor that: 1) payment has been made; or 2) a bona fide dispute for payment exits, listing the specific reasons for nonpayment, then Contractor shall be liable for damages resulting from suspension of the Work. If a reason specified is that labor, services, or materials provided by the Contractor are not provided in compliance with the Contract Documents or the Construction Documents, then the Contractor shall be provided a reasonable opportunity to cure the noncompliance or to compensate Owner for any failure to cure the noncompliance. No amount shall be added to the Contract Sum as a result of a dispute between Owner and Contractor unless and until such dispute is resolved in Contractor's favor.

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

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

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

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

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents and the Construction Documents so that the Owner can occupy or utilize the Work for its intended use; ; all Project systems included in the Work or designated portion thereof have been successfully tested and are fully operational; all required governmental inspections and certifications required of the Work have been made, approved and posted; designated initial instruction of Owner's personnel in the operation of Project systems has been completed; and all the required finishes set out in the Construction Documents are in place. The only remaining Work shall be minor in nature so that the Owner can occupy the Work or the applicable portion of the Work for all of its intended purposes on that date; and the completion of the Work by the Contractor will not materially interfere with or hamper Owner's normal school operations or other intended use. As a further condition of a determination of Substantial Completion, the Contractor shall certify that all remaining Work shall be completed within 30 days. Contractor shall complete Owner's Substantial Completion Certificate.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents and the Construction Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance Construction Documents or the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, then the Architect shall so notify the Contractor and Owner in writing, and the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. Except with the consent of the Owner, the Architect shall perform no more than five inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare sign and issue Owner's a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Final Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. Contractor agrees that the Owner may place and install as much equipment and furnishings as is possible before completion or partial completion of portions of the Work

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§ 9.9.2 Immediately prior to such partial occupancy use or installation, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon in writing, partial occupancy or use of a portion or portions of the Work or installation of furnishings an equipment shall not constitute acceptance of Work not complying with the requirements of the Contract Documents, nor shall it constitute evidence of Substantial Completion or Final Completion.

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly prepare, sign, and make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment certifying to the Owner that on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and Construction Documents and that the entire balance including all retainages found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. Final payment shall be made by the Owner in accordance with Owner's regular schedule for payments.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) using AIA Document G706, an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) evidence satisfactory to Owner that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) using AIA Document G707, consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) except for amounts currently withheld by Owner other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. In addition, the following items must be completed and received by the Owner before Final Payment will be due:

.1 Written certifications required by Section 10.5, 10.6, and 10.7

.2 Final list of subcontractors (AIA Document G705);"

.3 Contractor's certification in Texas Education Agency's Certification of Project Compliance, located at http://ritter.tea.state.tx.us/school.finance/facilities/cert_2004.pdf;

.4 Contractor's warranties, organized as required elsewhere in the Contract Documents;

.5 Maintenance and Instruction Manuals; and

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.6 Owner's Final Completion Certificate; and

.7 Record drawings and "as built" drawings. At the completion of the Project, the Contractor shall submit one complete set of "as built" drawings, with all changes made during construction, including concealed mechanical, electrical and plumbing items. The Contractor shall submit these as electronic, sepia, or other acceptable medium, in the discretion of the Owner. The "as-built" record drawings shall delete the seal of the Architect and/or the Engineer and any reference to those firms providing professional services to the Owner, except for historical or reference purposes.

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

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, and it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall not constitute a waiver of any Claims by the Owner.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc., latest edition and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration ("OSHA") 29 USC Section 651 et seq., and all amendments thereto. However, the Contractor's duties herein shall not relieve any Sub-contractor or any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, from the obligation to provide for the safety of their employees, persons and property and their requirements to maintain a work environment free of recognized hazards.

§ 10.1.2 Contractor's employees, agents, Sub-contractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not perform any service for Owner while under the influence of any amount of alcohol or any controlled substance, or use, possess, distribute, or sell alcoholic beverages while on Owner's premises. No person shall use, possess, distribute, or sell illicit or unprescribed controlled drugs or drug paraphernalia; misuse legitimate prescription drugs; or act in contravention of warnings on medications while performing the Work or on Owner's premises.

§ 10.1.3 Contractor has adopted or will adopt its own policy to assure a drug-free and alcohol-free workplace while on Owner's premises or performing the Work. Contractor will remove any of its employees, agents, sub-contractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such person, and at any time an incident occurs where drug or alcohol use could have been a contributing factor. Owner has the right to require Contractor to remove any person from performing the Work any time cause exists to

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suspect alcohol or drug use. In such cases, the person so removed may only be considered for return to work after the Contractor certifies as a result of a for-cause test, conducted immediately following removal that said person was in compliance with this Contract. Contractor will not use any person to perform the Work who fails or refuses to take, or tests positive on, any for-cause alcohol or drug test.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as other buildings, and their contents, fencing trees, shrubs, lawns, walks, athletic fields, facilities and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable full protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.2.4 When use or storage of hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel, and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosive materials on Owner's property is prohibited unless expressly approved in advance in writing by Owner and Architect.

§ 10.2.5 The Contractor shall promptly remedy damage and loss to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The foregoing obligations of the Contractor are in addition to the obligations under Paragraph 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

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§ 10.2.8 Injury or Damage to Person or Property

§ 10.2.8 The Contractor shall do all things necessary to protect the Owner's premises and all persons from damage and injury, when all or a portion of the Work is suspended for any reason.

§ 10.2.9 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work which cause death, bodily injury or property damage, giving full details and statements of any witnesses. In addition, if death, serious bodily injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

§ 10.2.10 Contractor's obligations under Section 10.2 as to each portion of the Project shall continue until Owner takes possession of and occupies that portion of the Project.

§ 10.2 11 If either party to the contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. Provided, however, Contractor understands that, under Texas law, Owner has tort immunity.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition. If Contractor encounters polychlorinated biphenyl (PCB), and the specifications require the PCB's removal, the Contractor shall remove the PCB and store it in marked containers at the jobsite provided by the Owner. If PCBs are found which are leaking, then Contractor shall stop work on the affected fixture and shall contact Owner for removal and disposal of the leaking PCBs.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contractor may be entitled to an equitable adjustment regarding the Date of Substantial Completion and/or Final Completion.

§ 10.3.3 IF CONTRACTOR IMPORTS HAZARDOUS MATERIALS ONTO THE PROJECT SITE, THEN CONTRACTOR HEREBY INDEMNIFIES AND HOLDS HARMLESS THE OWNER, ITS CONSULTANTS, TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES, AGAINST ANY CLAIMS ARISING OUT OF OR RELATED TO SUCH IMPORTATION, INCLUDING BUT NOT LIMITED TO COSTS AND EXPENSES THE OWNER INCURS FOR REMEDIATION OF A MATERIAL OR SUBSTANCE THE CONTRACTOR BRINGS TO THE SITE, AS PROVIDED FOR IN SUBPARAGRAPH 3.18.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site.

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§ 10.4 Emergencies

§ 10.4.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss.

§ 10.4.2 The performance of the foregoing services by the Contractor shall not relieve the subcontractors of their responsibility for the safety of persons and property and for compliance with all federal, state and local statutes, rules, regulations and orders of any governmental authority applicable to the conduct of the Work.

§ 10.5 ASBESTOS OR ASBESTOS-CONTAINING MATERIALS

§ 10.5.1 Contractor shall submit to the Architect a written certification addressed to the Owner that all materials used in the construction of this Project contain less than 0.10% by weight of asbestos and for which it can be demonstrated that, under reasonably foreseeable job site conditions, will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter. The written certification shall further state that, should asbestos fibers be found at this Project in concentrations greater than 0.1 fibers per cubic centimeter, then Contractor shall be responsible for determining which materials contain asbestos fibers and shall take all necessary corrective action to remove those materials from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.5.2 Final Payment shall not be made until this written certification has been received.

§ 10.6 LEAD-FREE MATERIAL IN POTABLE WATER SYSTEM

§ 10.6.1 Prior to payment of retainage and final payment, the Contractor and each subcontractor involved with the potable water system shall furnish a written certification that the potable water system is "lead-free".

§ 10.6.2 The written certification shall further state that should lead be found in the potable water system built under this Project, then Contractor shall be responsible for determining which materials contain lead and shall take all necessary corrective action to remove lead from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.7 HAZARDOUS MATERIALS CERTIFICATION

§ 10.7 The Contractor shall provide written certification that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by federal, state or local standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards; and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Project Manual related to Contract Closeout.

ARTICLE 11 INSURANCE AND BONDS

§ 11.0.1 No Work will be commenced and no equipment or materials can be shipped until all requirements of this Article have been satisfied, satisfactory evidence of insurance has been provided, and all insurance is in full force and effect. Contractor shall notify Owner and Architect in writing of any proposed nonconformity with these requirements, and shall notify Owner and Architect in writing of any insurance changes which occur during the terms required under the Contract Documents. Any deviation from these requirements can only be approved by Owner's Board of Directors. Any nonconformity may be grounds for termination or modification of the Contract. To the extent that Contractor is unable to procure the insurance designated herein because the insurance is not reasonably available or is cost-prohibitive, then Contractor shall provide written notice to Owner's Board of Directors. Said lack of insurance may then be grounds for termination or modification of this Agreement.

§ 11.0.2 Satisfactory evidence of insurance required by this Article shall be provided to Owner and Architect not later than five business days after execution of the Contract by Owner. Satisfactory evidence shall include copies of all required insurance policies, declarations, and endorsements themselves. In addition, Contractor shall also provide a duly-executed ACORD Form 25 Certificate of Liability Insurance naming Owner as a certificate holder and attaching all endorsements required herein. The Contractor shall furnish Owner all insurance amendments, renewals, notices, cancellations and additional endorsements, as they are provided to Contractor.

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§ 11.0.3 All insurance required herein shall be obtained from a company licensed to do business in the State of Texas by the Texas Department of Insurance, and shall be underwritten by a company rated not less than A-X in A.M. Best's Key Rating Guide, Property-Casualty, according to the latest posted ratings available on A.M. Best's website, www.ambest.com, and that permits waivers of subrogation.

§ 11.0.4 All insurance required herein shall name the Owner, its officers, employees, representatives or agents, as an additional insured, except Contractor's Worker's Compensation insurance.

§ 11.0.5 All insurance required herein shall, by endorsement, be primary insurance with respect to the Owner, its officers, employees, representatives or agents. All insurance shall be written on an occurrence basis, if available, and shall contain a waiver of subrogation in favor of Owner on all claims arising out of the Project. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, or did not pay the insurance premium directly or indirectly; and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.0.6 Any failure of Contractor to comply with the reporting provisions of the policies shall not affect the coverage provided to the Owner, its officers, employees, representatives or agents.

§ 11.0.7 All workers on the Project must be covered by the required insurance policies of the Contractor or a Subcontractor.

§ 11.0.8 Nothing contained in this Article shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1.1 The Contractor and the Contractor's Subcontractors shall purchase and maintain such insurance as will protect them and the Owner from claims which may arise out of, or result from, the Contractor's operations under the Contract whether such operations be by Contractor or by any Subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, including the following:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed, including private entities performing work at the site, and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project (see Sections 11.1.2.1 and 11.1.5);
.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
.4 Claims for damages insured by usual personal injury liability coverage;
.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
.7 Claims for bodily injury or property damage arising out of completed operations;
.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under the Contract Documents, including under Section 3.18; and
.9 . Claims for damages to the Work itself, through builder's risk insurance, pursuant to Section 11.4.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, written on an occurrence or basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. The stipulated limits of liability aggregate coverages shall be for this Project.

§ 11.1.2.1 Workers' Compensation:

.1 State: Statutory Benefits

.2 Employer's Liability: $____ per accident
$____ disease, policy limit
$____ disease, each employee

§ 11.1.2.2 Commercial General Liability:

.1 Each occurrence: $____ each occurrence
$____ aggregate

.2 Medical Expense (per person): $____ each occurrence

.3 Products & Completed Operations: $____ aggregate (to be maintained for a period of two years after Final Payment; Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during this period and Owner shall be named by endorsement as an Additional Insured for such coverage)

.4 Personal & Advertising Injury $____ aggregate

.5 Must include explosion, collapse, and underground (X, C, and U) coverage.

.6 Must include Completed Operations coverage for Contractor, its sub-contractors and Owner.

.7 Must Include Contractual Liability Coverage.

.8 Must Include General Aggregate Per Project Endorsement

§ 11.1.2.3 Contractual Liability:

.1 Property Damage shall be included in Commercial General Liability Coverage.

.2 Insurance sufficient to cover Contractor's contractual indemnities.

§ 11.1.2.4 Personal Injury:

.1 With Employment Exclusion deleted; shall be included in Commercial General Liability Coverage.

§ 11.1.2.5 Business Automobile Liability (including owned, non-owned, hired, or any other vehicles): (Note: Texas statutory minimum for school district is $100,000 per person, $300,000 per occurrence, $100,000 property damage)

.1 Bodily Injury (per person) $_____

.2 Bodily Injury (per accident) $_____

.3 Property Damage $_____

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§ 11.1.2.6 Umbrella Excess Liability coverages shall be:

.1 $_____each occurrence

.2 $_____aggregate

.3 Aggregate Per Project Endorsement

§ 11.1.2.7 All Risk Builder's Risk Insurance. If Contractor is a Construction Manager at Risk, then, as specified in each Amendment Number One, in a total amount equal to the Guaranteed Maximum Price; otherwise, in the total amount of the Contract Sum. See Section 11.3.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.1.5 Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

§ 11.1.6 Texas Workers' Compensation Insurance. A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Department of Insurance (TDI), or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-84), showing statutory workers' compensation insurance coverage for the Contractor's employees providing services on a Project is required for the duration of the Project.

§ 11.1.6.1 Duration of the Project includes the time from the beginning of the Work on the Project until the Contractor's work on the Project has been completed and accepted by the Owner.

§ 11.1.6.2 Persons providing services on the Project ("subcontractor" in Texas Labor Code Section 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 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.

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

§ 11.1.6.4 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.

§ 11.1.6.5 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the Contract.

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

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§ 11.1.6.7 The Contractor shall obtain from each person providing services on the Project, and provide to the Owner:

.1 A certificate of coverage, prior to that person beginning work on the Project, so the Owner 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 show on the current certificate of coverage ends during the duration of the Project.

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

§ 11.1.6.9 The Contractor shall notify the Owner 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.

§ 11.1.6.10 The Contractor shall post on each Project site a notice, in the text, form, and manner prescribed by the TDI, 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.

§ 11.1.6.11 The Contractor shall contractually require each person with whom it contracts to provide services on the 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:

.1 A certificate of coverage, prior to the other person beginning work on the Project; and

.2 A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

.5 Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;

.6 Notify the Owner 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.

§ 11.1.6.12 By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, 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 TDI's Division of Self-Insurance Regulation.

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Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

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

§ 11.1.6.14 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)

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 The Owner shall be responsible for purchasing and maintaining property and casualty insurance no later than the date on which Owner begins to occupy or use any completed or partially-completed portions of the Work. If Owner occupies or uses any completed or partially-completed portion of the Work on any stage, then such occupancy or use must be consented to by the insurer and authorized by public authorities having jurisdiction over the Work, pursuant to Paragraphs 9.9.1 and 11.4.5. To the extent of overlap between Owner's property insurance and Contractor's builder's risk insurance, Contractor's builder's risk shall be primary.

§ 11.2.3 Architect shall be responsible for purchasing and maintaining the Architect's liability and worker's compensation insurance as provided in the AIA Document B102-2017, as revised.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within five (5) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.2.4 PROPERTY INSURANCE

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"§ 11.2.4.1 BUILDER'S RISK INSURANCE Contractor shall obtain, at its expense, a builder's risk "all-risk" or equivalent insurance policy, including boiler and machinery insurance, in the amount of the initial Contract Sum (or, if the Project is a Construction Manager at Risk project, Guaranteed Maximum Price), plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis. Coverage shall insure against the perils of fire, (with extended coverage) and physical loss or damage including, without limitation or duplication of coverage, lightning, collapse, earthquake, flood, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, theft, vandalism, malicious mischief, falsework, testing and start-up, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, and all other perils, and shall include materials stored on-site, off-site and in transit. Owner shall be a named insured under the policy, and the insurance shall also include the interests of Contractor, subcontractors, and sub-subcontractors and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. Contractor shall be responsible for maintaining said builder's risk insurance until the date of Final Completion. If this policy excludes Employee Theft or Dishonesty coverage, including Third Parties, Contractor shall obtain separate coverage sufficient to protect Owner's interest and in an amount agreeable to Owner

The Owner as fiduciary shall have power to adjust and settle a loss with insurers. The Contractor shall pay all subcontractors their just shares of insurance proceeds received by the Subcontractor, and by appropriate agreements shall require subcontractors to make payment to their sub-subcontractors in similar manner. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor under the insurance proceeds.

Partial occupancy or use shall not commence until the insurance company providing this insurance has consented in writing, by endorsement or otherwise. Owner and Contractor shall take reasonable steps to obtain such consent and shall take no action without written mutual consent that would cause cancellation, lapse, or reduction of this insurance.

§ 11.3 Waivers of Subrogation

.

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 the Contractor shall furnish separate payment and performance bonds covering faithful performance of the Contract and payment of obligations arising thereunder each bond to be in a total amount equal to 100% of the Contract Sum, or Guaranteed Maximum Price if the Project is a Construction Manager at Risk project, whichever is applicable. Provided, however, no limitation herein shall limit Contractor's liability under the Contract Documents.

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Except as provided below, such bond shall be furnished to Owner before any work begins and not later than five business days after execution of the Contract by Owner. (If the Guaranteed Maximum Price is not known at the time that a Construction Manager at Risk contract is awarded, then the sum of the payment and performance bonds must each be in an amount equal to the Project budget. The Construction Manager at Risk shall deliver the bonds not later than the tenth day after the date the Construction Manager at Risk executes the Contract, unless the Construction Manager at Risk furnished a bid bond or other financial security acceptable to the District to ensure that the Construction Manager will furnish the required payment and performance bonds when the Guaranteed Maximum Price is established.) All bonds shall be issued by a surety company licensed, listed and authorized to issue bonds in the State of Texas by the Texas Department of Insurance, and shall fully comply with Texas Insurance Code Section 3503.001 et seq. and Texas Government Code Chapter 2253, or their successors. The surety company shall have a rating of not less than "A-X" according to the latest posted ratings on the A.M. Best website, www.ambest.com. The surety company shall provide, if requested, information on bonding capacity and other projects under coverage and shall provide proof to establish adequate financial capacity for this Project. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, then the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by a reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus. Contractor shall immediately notify the Owner and Architect in writing if there is any change in: the rating; insolvency or receivership in any State; bankruptcy; right to do business in the State; or status of Contractor's sureties at any time until Final Completion.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.4.3 The Contractor shall deliver copies of the required bonds to the Owner and Architect not later than five business days after execution of the Contract by Owner. All bonds will be reviewed by the Architect for compliance with the Contract Documents. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's Representative with Architect's recommendation.

§ 11.4.4 All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required Bonds on behalf of the Surety to affix thereto a certified and current copy of the power-of-attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.

§ 11.4.5 Bonds shall guarantee the faithful performance of all of the covenants, stipulations, and agreements of the Contract. Bonds shall be signed by an agent, resident in the State of Texas. If at any time during the continuance of the Contract, the Owner determines that the Contractor is unable to complete the Work in accordance with the Contract Documents, any of the Contractor's bonds become insufficient, the surety becomes insolvent, or the surety's rating drops below the required level, then the Owner shall have the right to require from the Contractor additional and sufficient sureties or other security acceptable to the Owner, which the Contractor shall furnish to the satisfaction of the Owner within ten (10) days after notice to do so. These contractual remedies are in addition to all remedies available by law. In default thereof, all payment or money due to the Contractor may be withheld until the Contractor provides additional surety or security.

§ 11.5 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.6 Adjustment and Settlement of Insured Loss

§ 11.6.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and

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Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.6.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. The Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's or Owner's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect or Owner, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect or Owner may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or work failing to conform to the requirements of the Contract Documents or Construction Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.1.2 The Owner may make emergency repairs to the Work or take such other measures necessary under the circumstances, if the Contractor does not promptly respond to a notice of defect or nonconforming Work. Contractor shall be responsible to Owner for this cost if the reason for the repairs is attributable to the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover such costs, then the Contractor shall pay the difference to the Owner on demand.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents or Construction Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct the Work as provided in 12.2.2.1.1. Nothing contained in this Section 12.2 is intended to limit or modify any obligations under the law or under the Contract Documents, including any warranty obligations, expressed or implied.

§ 12.2.2.1.1 If the Contractor fails to perform the corrective Work, then Owner may perform corrective Work, at Contractor's cost. If Owner performs corrective Work, then Owner may also remove nonconforming Work and store

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the salvageable materials or equipment at Contractor's expense. If the Contractor does not pay all costs incurred by Owner within ten (10) days after written notice, then Owner may, upon ten (10) additional days' written notice, sell the removed materials and equipment in accordance with Owner's policies, and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, then the Contractor shall pay the difference to the Owner.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not extended by corrective Work performed by the Contractor pursuant to this Section 12.2. but only as to that corrected Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.2.6 Contractor shall replace, repair, or restore any parts of the Project or furniture, fixtures, equipment, or other items placed therein (whether by Owner or any other party) that are injured or damaged by any such parts of the Work that do not conform to the requirements of the Construction Documents or the Contract Documents or by defects in the Work.

§ 12.2.7 The provisions of this Section 12.2 apply to Work done by Subcontractors of the Contractor as well as Work done directly by employees of the Contractor. The provision for this Section 12.2.7 shall not apply to corrective work attributable solely to the acts or omissions of any separate contractor of Owner (unless Contractor is acting in such capacities). The cost to Contractor of performing any of its obligations under this Section 12.2.7 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.8 If, however, Owner and Contractor deem it inexpedient to require the correction of Work damaged or not done in accordance with the Construction Documents or the Contract Documents, then an equitable deduction from the Contract Sum shall be made by agreement between Contractor and Owner. Until such settlement, Owner may withhold such sums as Owner deems just and reasonable from moneys, if any, due Contractor. The settlement shall not be unreasonably delayed by the Owner and the amount of money withheld shall be based on estimated actual cost of the correction to Owner.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

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§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability or effect of the remainder of the Contact Documents.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made at appropriate times as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals which shall be included in the Cost of the Work. Provided, however, per Texas Government Code Chapter 2269, Owner shall bear all costs of inspection services, the testing of construction materials engineering, and the verification testing services necessary for acceptance of the facility by the Owner.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additonal testing, inspection, or approval not included under Section 13.4.1, then the Owner shall provide or contract such additional testing, inspection, or approval, Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including but not limited to those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect with copy to the Owner.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Undisputed Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate provided by Texas Government Code Section 2251.025. Any such payment shall be deemed overdue on the thirty-first day after Owner received Architect's invoice or Contractor's Certificate for Payment for the Architect, if Owner's Board of Directors meets more than once per month. Any such payment shall be deemed overdue on the forty-sixth day after Owner receives Architect's invoice or Contractor's Certificate for Payment from the Architect, if Owner's Board of Directors meets once a month or less frequently. No interest shall be due on sums properly retained by Owner, except as provided by law, or on disputed sums unpaid by Owner.

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§ 13.7 TIME LIMITS ON LITIGATION

The Owner and Contractor shall commence all litigation, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the dispute resolution method selected in the Agreement and within the time period specified by applicable law, but in any case not more than 10 years after the date of Final Completion of the Work. The Owner and Contractor waive actions not commenced in accordance with this Section 13.7.

§ 13.8 EQUAL OPPORTUNITY IN EMPLOYMENT

§ 13.8.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, age, disability, sex, or national origin. The Contractor agrees to post in conspicuous places, available to employees and applicants, notices setting forth the Contractor's nondiscrimination policies.

§ 13.8.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, age, disability, sex, or national origin.

§ 13.9 RECORDS

§ 13.9.1 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll records, daily reports, diaries, logs, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, other financial data and job meeting minutes applicable to the Project, in a manner which maintains the integrity of the documents. Job Records must be retained by Contractor for at least twelve (12) years after the date of Final Completion of the Project. Within 10 days of Owner's request, Contractor shall make such Job Records available for inspection, copying and auditing by the Owner, Architect or their respective representatives, at Owner's central office.

§ 13.9.2 If Contractor is a Construction Manager at Risk, then Contractor shall also maintain, in accordance with the provisions of Section 13.9.1, the following: subcontract files, including proposals of successful and unsuccessful bidders, bid recaps and subcontractor payments; original estimates; estimating work sheets; general ledger entries detailing cash and trade discounts received; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to the Contract.

§ 13.9.3 Contractor shall keep a full and detailed financial accounting system and shall exercise such controls as may be necessary for proper financial management under this Contract; the accounting and control systems shall be satisfactory to the Owner and shall be subject to the provisions of Section 13.9.1.

§ 13.9.4 Contractor shall keep all Construction Documents related to the Project, subject to the provisions of Section 13.9.1, provided, however, Contractor shall not destroy said documents until Contractor has confirmed with Owner in writing that Owner has obtained a copy of all as-built drawings.

§ 13.9.5 In the event that an audit by the Owner reveals any errors/overpayments by the Owner, then the Contractor shall refund to the Owner the full amount of such overpayments within thirty (30) days of such audit findings, or the Owner, at its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.10 PROPRIETARY INTERESTS AND CONFIDENTIAL INFORMATION

§ 13.10.1 Neither Architect nor Contractor shall use the image or likeness of Owner's Project or Owner's official logo or emblem and any other trademark, service mark, or copyrighted or otherwise protected information of Owner, without Owner's prior written consent. Contractor and Architect shall not have any authority to advertise or claim that Owner endorses Architect or Contractor's services, without Owner's prior written consent.

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§ 13.10.2 Neither Architect nor Contractor shall disclose any confidential information which Comes into the possession of Architect or Contractor at any time during the Project, including but not limited to, the location and deployment of security devices, security access codes, student likenesses, student record information or employee information.

§ 13.10.3 The parties acknowledge that, as a public entity in the State of Texas, Owner is subject to, and must comply with, the provisions of the Texas Public Information Act, Texas Government Code Section 552, et seq.

§ 13.11 SEX OFFENDER REGISTRATION

§ 13.11.1 Contractor agrees that, in connection with the Work, no individual who is required to register as a sex offender under Texas Code of Criminal Procedure Chapter 62 shall be assigned to perform Work on any property of the Owner. Pursuant to Texas Education Code § 38.022, and consistent with Owner's policies, Contractor shall confirm by reasonable inquiry of each employee, agent, Subcontractor, and Sub-subcontractor whose duties may involve direct contact with students that the individual is not on the sex offender registry. If Contractor learns or has reason to believe that any such individual is on the registry, Contractor shall immediately remove that individual from all Work on Owner's property and notify Owner in writing.

§ 13.12 FAMILY EDUCATIONAL RIGHTS AND PRIVACY

§ 13.12.1 In the course of the Work, Contractor, its Subcontractors, and Sub-subcontractors may have incidental access to or contact with personally identifiable information from "education records" within the meaning of the Family Educational Rights and Privacy Act, 20 U.S.C. § 1232g, and 34 C.F.R. Part 99 ("FERPA"). Contractor shall (1) treat all such information as strictly confidential, (2) use such information solely as necessary to perform the Work, (3) not redisclose such information to any third party except as expressly authorized by Owner in writing, and (4) require its Subcontractors and Sub-subcontractors to comply with this Section. The obligations of this Section shall survive completion of the Work and final payment.

§ 13.12.2 Contractor acknowledges Owner's obligations under Texas Education Code § 26.013 regarding parental rights of access to student information, and shall cooperate with Owner in fulfilling those obligations.

§ 13.12.3 Contractor and its Subcontractors and Sub-subcontractors shall comply with mandatory reporting obligations under Texas Family Code § 261.101 and Texas Education Code § 38.0041 to report suspected child abuse or neglect to the appropriate authorities.

§ 13.13 VERIFICATION REGARDING FIREARM ENTITY AND FIREARM TRADE ASSOCIATION DISCRIMINATION

§ 13.13.1 To the extent required by Texas Government Code Chapter 2274 (as added by Acts 2021, 87th Leg., R.S., ch. 706 (S.B. 19)) and applicable to this Contract, Contractor verifies that: (1) Contractor does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and (2) Contractor will not discriminate during the term of the Contract against a firearm entity or firearm trade association. This verification is not required if Contractor does not have at least ten (10) full-time employees or if the Contract has a value of less than $100,000 that is paid wholly or partly from public funds of Owner.

§ 13.14 VERIFICATION REGARDING ENERGY COMPANY BOYCOTT

§ 13.14.1 To the extent required by Texas Government Code Chapter 2276 (as added by Acts 2021, 87th Leg., R.S., ch. 529 (S.B. 13)) and applicable to this Contract, Contractor verifies that: (1) Contractor does not boycott energy companies; and (2) Contractor will not boycott energy companies during the term of the Contract. This verification is not required if Contractor does not have at least ten (10) full-time employees or if the Contract has a value of less than $100,000 that is paid wholly or partly from public funds of Owner.

§ 13.15 CERTIFICATE OF INTERESTED PARTIES (FORM 1295)

§ 13.15.1 To the extent required by Texas Government Code § 2252.908 and 1 Texas Administrative Code § 46.1 et seq., Contractor shall, prior to Owner's award and execution of the Contract, complete, sign, and deliver to Owner a Texas Ethics Commission Form 1295 (Certificate of Interested Parties), generated through the Texas Ethics Commission electronic filing application, disclosing any interested parties. Contractor shall provide an updated Form 1295 in connection with any amendment that materially modifies the parties to or terms of the Contract.

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§ 13.16 CONFLICT OF INTEREST DISCLOSURE

§ 13.16.1 Contractor acknowledges its obligations under Texas Local Government Code Chapter 176 to file a Conflict of Interest Questionnaire (Form CIQ) with Owner if Contractor has an employment or other business relationship with a local government officer of Owner or a family member of such officer, as those terms are defined in Chapter 176, that results in taxable income exceeding $2,500 in the preceding twelve (12) months, or has given gifts to such officer or family member exceeding $100 in value in the preceding twelve (12) months. Contractor shall file the Form CIQ with Owner's records administrator within seven (7) business days after becoming aware of facts that require its filing.

§ 13.17 VERIFICATION OF NO BOYCOTT OF ISRAEL

§ 13.17.1 Pursuant to Texas Government Code Chapter 2271, Contractor verifies that it is currently not boycotting Israel and will not boycott Israel during the term of the Contract. This verification is made and binding through Contractor's execution of the Agreement, of which these General Conditions are a part by incorporation. This verification is not required if Contractor does not have at least ten (10) full-time employees or if the Contract has a value of less than $100,000 that is paid wholly or partly from public funds of Owner. Any boycott of Israel by Contractor during the term of the Contract shall be cause for immediate termination of the Contract.

§ 13.18 CERTIFICATION REGARDING CONTACTS WITH FOREIGN TERRORIST ORGANIZATIONS

§ 13.18.1 Pursuant to Texas Government Code §§ 2252.151–.154, Contractor certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or to provide supplies or services to, a foreign organization designated by the United States Secretary of State as a Foreign Terrorist Organization under federal law. This certification is made and binding through Contractor's execution of the Agreement, of which these General Conditions are a part by incorporation.

§ 13.19 CERTIFICATION REGARDING CHILD SUPPORT

§ 13.19.1 Pursuant to Texas Family Code § 231.006, Contractor certifies that the individual or business entity named in the Contract is not ineligible to receive the payments specified in the Contract, and acknowledges that the Contract may be terminated and payment may be withheld if this certification is inaccurate. This certification is made and binding through Contractor's execution of the Agreement, of which these General Conditions are a part by incorporation.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment of undisputed sums on an approved Certificate for Payment within the time stated in the Contract Documents; or

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, then, after the applicable time period, the Contractor may, upon seven (10) days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination.

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§ 14.1.4 If the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon twenty (20) additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents;
- .5 fails to furnish the Owner, upon request, with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- .6 engages in worker misconduct in violation of Article 3.3.2 or engages in conduct that would constitute a violation of state or federal criminal law, including but not limited to, the laws prohibiting certain gifts to public servants, or engages in conduct that would constitute a violation of the Owner's ethics or conflict of interest policies; or
- .7 fails to proceed continuously and diligently with the construction and completion of the Work, except as permitted under the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, the Owner, subject to any prior rights of surety may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any further payment shall be limited to amounts earned to the date of termination

§ 14.2.4 If the costs of finishing the Work, including compensation for the Architects' services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, exceed the unpaid balance of the Contract Sum or Guaranteed Maximum Price if the Project is a Construction Manager at Risk project, then the Contractor and/or its Surety shall pay the difference to the Owner. The amount to be paid to the Owner shall be certified by Architect upon application. The obligation for payment shall survive termination of the Contract.

§ 14.2.5 The parties hereby agree that: 1) if an order for relief is entered on behalf of the Contractor, pursuant to Chapter 11 of the U.S. Bankruptcy Code; 2) if any other similar order is entered under any debtor relief laws; 3) if Contractor makes an assignment for the benefit of one or more of its creditors; 4) if a receiver is appointed for the benefit of its creditors; or 5) if a receiver is appointed on account of its insolvency, any such event could impair or frustrate Contractor's performance of the Contract Documents. Accordingly, it is agreed that upon occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents. Failure to comply with such request within ten (10) days of delivery of the request shall entitle Owner to terminate the Contract and to the accompanying rights set forth in Subparagraphs 14.2.1 through 14.2.6. In all events, pending receipt of adequate assurance of performance and actual performance in accordance with the Contract Documents, Owner shall be

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entitled to proceed with the Work with Owner's own forces or with other Contractors on a time and material or other appropriate basis, the cost of which will be charged against the Contract Sum.

§ 14.2.6 As required by Texas Government Code Chapter 2253, if a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, then the Surety shall promptly perform the Work, in full accordance with the plans, specifications and Contract Documents. Unless otherwise agreed in writing between the Surety and the Owner, the Surety shall complete the Work by the Surety entering into a Contract acceptable to Owner, with a Contractor acceptable to Owner, and shall obtain new Payment and Performance Bonds as required by law.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspnd, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum, Guaranteed Maximum Price and Contract Time may be adjusted by mutual agreement for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. Furthermore, if this Contract is a multi-year contract funded through Owner's current general funds that are not bond funds, then the Owner's Board of Directors has the right to not appropriate adequate monies for the next fiscal year and to terminate this Contract at the end of each fiscal year during the term of the Contract, without the Owner incurring any further liability to Contractor as a result of such termination.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination. Such payment shall not cause the Contract Sum, or Guaranteed Maximum Price if the Project is a Construction Manager at Risk project, to be exceeded. Such payment shall not include overhead and profit for Work not executed.

§ 14.4.4 Upon determination by a Court of competent jurisdiction that termination of the Contractor pursuant to Section 14.2 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Section 14.4, and Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Section14.4.

ARTICLE 15 CLAIMS AND DISPUTES OF CONTRACTOR

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by the Contractor seeking, as a matter of right, payment of money, interpretation of the Contract terms, extension of time , or other relief with respect to the terms of the Contract, the Project of Work. The responsibility to substantiate Claims shall rest with the Contractor.

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§ 15.1.2 Time Limits on Claims
The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Final Completion of the Work. The Contractor waives all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims
§ 15.1.3.1 Claims by the Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the Owner with a copy sent to the Architect. Claims by Contractor under this Section 15.1.3.1 shall be initiated within 21calendar days after occurrence of the event giving rise to such Claim or within 21 days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice titled "Notice of Claim" ("Notice") and sent to the Architect and Owner's designated representative. The Notice shall clearly set out the specific matter of complaint, and the impact or damages which may occur or have occurred as a result thereof, to the extent that the impact or damages can be assessed at the time of the Notice. If the impact or damages cannot be assessed as of the date of the Notice, then the Notice shall be amended at the earliest date that is reasonably possible. It is imperative that Owner receive timely specific Notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly. Any claim or portion of a claim by Contractor that has not been made the specific subject of a Notice within ninety-one (91) days after the occurrence of the event giving rise to such claim or within ninety-one (91) days after the Contractor first knew or should have known of the condition giving rise to the Claim, whichever is earlier, shall be waived. Pursuant to Texas Civil Practices and Remedies Code Section 16.071, Contractor agrees that this is a reasonable notice requirement.

§ 15.1.4 Continuing Contract Performance
§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 as amended and Article 14, as amended the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make undisputed payments for work performed in accordance with the Contract Documents.

§ 15.1.5 Claims for Additional Cost OR AN INCREASE IN THE CONTRACT SUM OR GUARANTEED MAXIMUM PRICE
If the Contractor wishes to make a Claim for an additional cost or an increase in the Contract Sum or Guaranteed Maximum Price written notice as provided in Section 15.1.3 shall be given to the Owner and Architect Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. The Architect will promptly investigate such Claim and report findings and a recommended resolution in writing to the Owner and Contractor. If the Claim is approved by Owner's Board of Directors, or Owner's representative if provided for herein, then Contractor shall proceed with the execution of the Work that is the subject matter of the Claim. If the Claim is rejected by the Owner, then Contractor may pursue alternative dispute resolution as provided for in the Contract Documents.

§ 15.1.6 Claims for Additional Time
§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and prevented the execution of major items of work on normal working days. Adverse weather conditions' means unusually severe weather which is beyond the normal weather recorded and expected for the locality and/or the season or seasons of the year.

§ 15.1.6.3 Time extensions may be granted for rain days in any month, provided that the rainfall prevented the execution of major items of work on normal working days. No day will be counted as a rain day when substantial Contractor forces are able to perform Work on the Project for more than fifty percent (50%) of the usual workday or

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when the stage of the Work on the Project is not adversely impacted. The number of rain days shown in the above schedule for the first and last months of the Contract will be prorated in determining the total number of rain days expected during the period of the Contract.

§ 15.1.6.4 No extension of time shall be made to the Contractor because of hindrances or delays from any cause which is the fault of Contractor or Contractor's Subcontractors or under Contractor's control. Claims for extension of time may only be considered because of rain delays, or hindrances or delays which are the fault of Owner and/or under Owner's control, but only to the extent that Substantial Completion of the Project is adjusted beyond the original Substantial Completion date. Only claims for extension of time shall be considered because of hindrances or delays not the fault of either Contractor or Owner, but only to the extent that Substantial Completion of the Project exceeds the Substantial Completion date established for the Work. Board approval shall be required for any extension of time. No damages shall be paid for delays. Contractor shall only be entitled to time extensions per the terms of the Contract Documents.

§ 15.1.6.5 Requests for time extension shall be submitted on a monthly basis and shall specify the time delay, the cause of the delay, and the responsible party for the delay, whether Contractor, Owner, rain day, or other. No claims for damages for delay shall be made by Contractor. Any claim not submitted under the terms of this Section shall be waived.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor waives Claims against the Owner for consequential damages arising out of or relating to this Contract including, but not limited to, any amount owed as compensation for the increased cost to perform the Work as a direct result of Owner-caused delays or acceleration.

§ 15.2 RESOLUTION OF CLAIMS AND DISPUTES

§ 15.2.1 Recommendation of Architect.

Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for written recommendation. An initial recommendation by the Architect shall be required as a condition precedent to mediation or litigation of all Claims by the Contractor arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no recommendation having been rendered by the Architect."

§ 15.2.2 The Architect will review Claims and within ten days of the receipt of the Claim take one of the following actions: (1) request additional supporting data from the Contractor, or (2) make a written recommendation to the Owner, with a copy to the Contractor.

§ 15.2.3 In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in making a written recommendation.

§ 15.2.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished.

§ 15.2.5 Following receipt of the Architect's written recommendation regarding a Claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Sum or Guaranteed Maximum Price and/or Contract Time. If no agreement can be reached, then either party may request mediation of the dispute pursuant to Section 15.3.

§ 15.2.6 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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§ 15.3 Alternative Dispute Resolution

§ 15.3.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived under the terms of the Contract Documents, shall, after written recommendation by the Architect or 30 days after submission of the Claim to the Architect, be subject to mediation at the request of either party. Owner and Contractor expressly agree that mediation shall be a condition precedent to the initiation of any litigation arising out of such Claims. Claims for injunctive relief shall not be subject to this Section.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation. Requests for mediation shall be filed in writing with the other party to the Contract. Mediation shall be subject to and in accordance with Chapter 154 of the Texas Civil Practice & Remedies Code. Mediation shall be conducted by a mutually-agreed-upon mediator. In the event that the parties are unable to agree on a mediator, then the mediation shall be conducted by the Center for Public Policy Dispute Resolution at the University of Texas School of Law.

§ 15.3.3 The parties shall share the mediator's fee equally and, if any filing fee is required, shall share said fee equally. Mediation shall be held within the county where the Owner's main administrative office is located, unless another location is mutually agreed upon by the parties. Agreements reached in mediation shall be reduced to writing, considered for approval by the Owner's Board of Directors, signed by the parties if approved by the Board of Directors, and, if signed, shall thereafter be enforceable as provided by the laws of the State of Texas.

§ 15.3.4 Any claim not resolved in mediation shall be subject to litigation pursuant to Section 13.1.

§ 15.4 NO Arbitration

§ 15.4.1 Notwithstanding anything to the contrary in the Contract Documents or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

§ 15.4.4.4 Contractor stipulates that Owner is a political subdivision of the State of Texas, and, as such, enjoys immunities from suit and liability provided by the Constitution and laws of the State of Texas. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically authorized by law.

15.4.4.5 In any adjudication under this Agreement, reasonable and necessary attorneys' fees may be awarded to the prevailing party.

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APPENDIX B
PREVAILING
WAGE

"General Decision Number: TX20260255 05/18/2026

State: Texas

Construction Types: Building

Counties: Texas Counties of
Hidalgo

Modification Number	Publication Date
0	01/02/2026
1	05/18/2026

BOIL0074-003 01/01/2025

	Rates	Fringes
BOILERMAKER	$ 33.17	24.92

ENGI0178-005 06/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR ((3) HYDRAULIC CRANES 59 TONS AND UNDER)	$ 32.35	13.10
POWER EQUIPMENT OPERATOR ((1) TOWER CRANE)	$ 32.85	13.10

IRON0084-011 06/01/2024

	Rates	Fringes

IRONWORKER: ORNAMENTAL.....$ 28.26
8.13

PLUM0412-004 01/02/2024

Rates
Fringes
PLUMBER.....$ 40.74
15.35

SUTX2014-031 07/21/2014

Rates
Fringes
TRUCK DRIVER: WATER TRUCK.....$ 12.00
4.11
TRUCK DRIVER: SEMI-TRAILER TRUCK.....$ 12.50
0.00
TRUCK DRIVER: FLATBED TRUCK.....$ 19.65
8.57
TRUCK DRIVER: DUMP TRUCK.....$ 12.39
1.18
TILE SETTER.....$ 12.15
0.00
TILE FINISHER.....$ 11.22
0.00
SHEET METAL WORKER, EXCLUDES HVAC DUCT INSTALLATION.$ 21.13
6.53
SHEET METAL WORKER (HVAC DUCT INSTALLATION ONLY)....$ 18.40
2.12
ROOFER.....$ 11.42
0.00
PIPEFITTER.....$ 15.22
3.16
PAINTER: BRUSH, ROLLER, AND SPRAY.....$ 11.27
0.00
OPERATOR: ROLLER.....$ 12.70
0.00
OPERATOR: PAVER (ASPHALT, AGGREGATE, AND
CONCRETE).....$ 16.03
0.00
OPERATOR: MECHANIC.....$ 17.00
0.00
OPERATOR: LOADER.....$ 12.87
0.70
OPERATOR: GRADER/BLADE.....$ 10.00
0.00

OPERATOR: FORKLIFT.....$ 14.83
0.00
OPERATOR: DRILL.....$ 16.22
0.34
OPERATOR: BULLDOZER.....$ 18.29
1.31
OPERATOR: BOBCAT/SKID STEER/SKID LOADER.....$ 13.93
0.00
OPERATOR: BACKHOE/EXCAVATOR/TRACKHOE.....$ 14.04
1.01
LABORER: ROOF TEAROFF.....$ 10.06
0.00
LABORER: PIPELAYER.....$ 11.00
3.47
LABORER: MASON TENDER - CEMENT/CONCRETE.....$ 10.89
0.96
LABORER: MASON TENDER - BRICK.....$ 10.00
0.00
LABORER: COMMON OR GENERAL.....$ 8.00
0.00
IRONWORKER, STRUCTURAL.....$ 15.04
4.34
IRONWORKER, REINFORCING.....$ 12.01
0.00
INSULATOR - MECHANICAL (DUCT, PIPE & MECHANICAL
SYSTEM INSULATION).....$ 11.54
2.17
ELECTRICIAN.....$ 18.44
4.53
CEMENT MASON/CONCRETE FINISHER.....$ 12.46
0.00
CARPENTER.....$ 14.21
2.22
BRICKLAYER.....$ 16.17
0.00

-

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.
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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide

employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Note: Executive Order 13658 generally applies to contracts subject
to the Davis-Bacon Act that were awarded on or between January 1,
2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does
not apply to contracts subject only to the Davis-Bacon Related Acts
regardless of when they were awarded. If a contract is subject to
Executive Order 13658, the contractor must pay all covered workers
at least $13.65 per hour (or the applicable wage rate listed on this
wage determination, if it is higher) for all hours spent performing on
the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually.
Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular

rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ?SU?, ?UAVG?, ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ?SU? identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may

include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

�SU� wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The �SA� identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the �SA� identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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APPENDIX C DISCLOSURE OF INTERESTED PARTIES

Under certain circumstances, the District is required to comply with Texas Government Code, Section 2252.908, Disclosure of Interested Parties. If the District is entering into a contract with a "business entity" (defined below) which requires action by the Board of Trustees or which has a value of the contract is at least $1 million, Section 2252.908, requires the District obtain a Disclosure of Interested Parties Form 1295 from the contracting business entity that, at the time the contract is signed binding the parties. The form requires disclosure of each "interested party" to the contract of which the contracting business entity is aware, and must be signed by an authorized agent of the contracting business entity acknowledging that disclosure is made under oath and under penalty of perjury.

Since the Respondent qualifies as a "business entity" and the contract to be entered for this solicitation is for a value greater than $1 Million or requires action or a vote by the Board of Trustees the selected Respondent will be required complete and submit Form 1295. **THE FORM MAY ONLY BE FILED ELECTRONICALLY.**

Form 1295 must be submitted on the form promulgated by the Texas Ethics Commission and in compliance with the Commission's rules, at the time the business entity submits the signed contract to the District. The form must be completed electronically and the process for doing so can be found at the Texas Ethics Commission website at: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm. The filing process will include:

1. **Completing Form 1295 electronically** with the Texas Ethics Commission using the online filing application. The portal for completion of Form 1295, instructions for completion and answers to Frequently Asked Questions can be found at the Texas Ethics Commission website: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

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

3. Having an authorized agent of the business entity **sign the form before a notary public.**

4. **Submitting** the completed, signed and notarized Form 1295, showing the certification of filing with your signed contract.

The District will then acknowledge the receipt of the filed Form 1295 by notifying the Texas Ethics Commission of the receipt of the filed Form 1295 no later than the 30th day after the date the contract is executed by the District, binding all parties to the Contract. Within seven (7) business days after receiving acknowledgement from the District the Texas Ethics Commission will post the completed Form 1295 to its website.

A copy of the current Form 1295 is attached hereto for your reference. You are encouraged to contact your own legal counsel with any questions you may have about the process.

The following **definitions** apply:

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

2. ***"Interested Party"*** means a person:

a) who has a *controlling interest* in a Business Entity with whom the District contracts; or

b) who actively participates in facilitating the contract or negotiating the terms of the contract, including a broker, intermediary, adviser, or attorney for the Business Entity. TEX. GOV'T CODE § 2252.908(3).

3. ***"Controlling interest"*** means:

a) an ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent;

b) membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or

c) service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers.

4. ***"Intermediary"*** means a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity who:

a) receives compensation from the business entity for the person's participation;

b) communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and

c) is not an employee of the business entity. TEX. ETHICS COMM. RULE 46.3(e).

SECTION 00 02 00
REQUEST FOR COMPETITIVE SEALED PROPOSALS

PROJECT and PROJECT NO:

HVAC Projects 2026-2027
Mercedes, Edinburg, Olmito, Texas
CSP 27-020 HVAC PROJECTS 26-27

DUE DATE AND TIME:

Thursday, November 5, 2026 @ 2:00 p.m. C.S.T.
South Texas ISD – Administration
7001 E. Expressway 83
Mercedes, Texas 78570

PRE-BID CONFERENCE & SITE VISITS:

Tuesday, October 27, 2026 @ 10:00 a.m. C.S.T.
South Texas ISD – Administration
7001 E. Expressway 83
Mercedes, Texas 78570

Proceed to
Health Professions 700 Med High Dr. Mercedes, Texas 78570
World Scholar 510 S. Sugar Rd. Edinburg, TX 78539
Medical Professions 10650 North Expressway 77/83, Olmito, TX 78575

ARCHITECT:

David Monreal
Gomez Mendez Saenz
1150 Paredes Line Road
Mercedes, Texas 78570
(956) 546-0110

Specification packages will be available at our district website: https://www.stisd.net/departments/business-finance/purchasing/bid-opportunities

Proposals must be on a lump sum basis including General Contract, Civil, Electrical and Mechanical work. Proposal security in the amount of five percent (5%) of the largest possible total of proposal submitted must accompany each proposal in accordance with the Instruction to Bidders. Performance and payment bonds for one hundred percent (100%) of the contract value will be required upon issuance of contract.

South Texas ISD Business Office will receive request for competitive sealed proposals for **HVAC Projects 2026-2027, CSP 27-020 – HVAC PROJECTS 26-27** no later than 2:00 PM CST, Friday, August. 14, 2026. Late submittals will not be considered. South Texas ISD will be accepting sealed CSP on hardcopy through the mail or hand delivery to South Texas I.S.D. Business Office, 7001 E. Expressway 83, Mercedes, Texas 78570 by the date and time specified, and it must be clearly labeled **CSP 27-020 HVAC Projects 2026-2027**.

The awarding of the proposal will take place at a public South Texas ISD board meeting. The Board of Directors of South Texas I.S.D. reserves the right to accept, reject any and/or all proposals, waive minor technicalities, to award contracts for individual items as they may appear advantageous to the South Texas ISD or to award the competitive sealed proposal to the most responsible offeror which best serves the interest of the South Texas I.S.D.

* Builders Risk Insurance is required equal to amount of Bid (including Alternates).

INSTRUCTIONS TO BIDDERS

PART 1 – INSTRUCTIONS TO BIDDERS

1.1 Instructions to Bidders

A. AIA Document A701, “Instructions to Bidders,” is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A701, “Instructions to Bidders,” is bound in this Project Manual.

B. Bidders shall submit their bid in the following formats:

1. Original Hard Copy

PART 2 – SELECTION CRITERIA

1.1 The following criteria shall be used by the Owner for the ranking and selection of Bidders

A. PRICE (25%)

B. CONSTRUCTION EXPERIENCE AND PERFORMANCE

1. EXPERIENCE (20%)
    a. Business Experience
    b. Location
    c. South Texas Experience
    d. Project Management
2. PERFORMANCE (35%)
    a. Quality of Work / Documentation of Meetings
    b. Subcontractors List
    c. History of Meeting Deadlines
    d. Closing Out Projects
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    ii. Review Audit or Compilation Report
    iii. Bank Reference(s)

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    i. Treasury Listed Bond (Federal, State, or Unlisted Bond Co.)
    ii. Bonding Capacity

c. Bankruptcy History

d. Litigation History

e. Lawsuit History (Company or Owner)

f. Criminal History

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South Texas ISD

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South Texas ISD

HVAC Projects 2026-2027

ARCHITECTS - PLANNERS

Gomez Mendez Saenz, Inc.

CONSULTANTS

Ethos Engineering
Green Rubiano & Associates



July 31, 2026

GMS ARCHITECTS

David Monreal, AIA

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DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL

A. HVAC PROJECTS 2026 - 2027
   1. Health Professions (Mercedes)
      a. Administration Area
   2. Medical Professions (Olmito)
      a. Server Room
   3. World Scholars (Edinburg)
      a. Albert Hughes Building, Library Building and Kitchen Area
      b. Alternate #1 at Administration Area, Ductwork Replacement

B. South Texas ISD

C. Texas

D. Architect Project No. S2026260

E. District No. CSP 27-020 HVAC Project 26-27

F. GMS ARCHITECTS

G. GMS Architects

H. 1150 Paredes Line Road

I. Brownsville, TX 78521

J. Phone: 956.546.0110

K. Issued: August 7, 2026

END OF DOCUMENT 000101

DOCUMENT 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
2. Submittal Format: Submit One Electronic copy of each written Procurement Substitution Request, using CSI Substitution Request Form 1.5C.

a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
2) Copies of current, independent third-party test data of salient product or system characteristics.
3) Samples where applicable or when requested by Architect.
4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum only to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Work restrictions.
5. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: **HVAC Projects 2026 - 2027**

1. Project Locations: STISD Health Professions
700 Med High Drive
Mercedes, Texas 78570

STISD Medical Professions
10650 N. Expressway US-77
Olmito, Texas 78575

STISD World Scholars
510 S. Sugar Rd
Edinburg, Texas 78539

B. Owner: South Texas ISD

1. Owner's Representative: Dr. Sandra Ochoa
Superintendent of Schools
7001 E. Expressway 83
Mercedes, Tx 78570
956-514-4222
sandra.ochoa@stisd.net

C. Architect: GMS Architects

1. Architect's Representative: David A. Monreal, AIA
   1150 Paredes Line Road
   Brownsville, Tx 78521
   956-546-0110
   dmonreal@gmsarchitects.com

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. MEP Consultant: Ethos Engineering
   Guillermo Quintanilla
   1126 South Commerce St.
   Harlingen, Tx 78550
   956-230-3435
   gquin@ethoseng.net

2. Structural Consultant: Green, Rubiano & Associates
   Rolando Rubiano, P.E.
   1220 W. Harrison Ave.
   Harlingen, Tx 78550
   956-428-4461
   rrubiano@graengineering.com

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. HVAC Upgrades at Health Professions in Mercedes Campus (Administration Area), Medical Professions in Olmito Campus (Server Room) and World Scholars Campus in Edinburg (Albert Hughs Building, Library Building and Kitchen Area). Refer to MEP Spec Section 260010 Summary of Electrical Work for more information.

B. Type of Contract: Competitive Sealed Proposal (CSP)

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.5 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. All work to be completed on overnight hours ONLY. Request for weekends or Holidays will need to be submitted to District and specific campus for approval. Refer to Front End Documents - District Instructions to bidders for specifics on available work hours.

B. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

C. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

D. Employee Screening: Comply with Owner's requirements for background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 011100 -TEXAS DEPARTMENT OF INSURANCE

WINDSTORM CERTIFICATION OF NEW STRUCTURES

DELEGATED RESPONSIBILITY TO THE GENERAL CONTRACTOR

PART 1 - GENERAL

1.1 SUMMARY

A. The general contractor (Contractor) shall be responsible for the windstorm certification of all building envelope repairs, assembly replacements and alterations through the Texas Department of Insurance (TDI). The general contractor shall contract with a TDI Appointed Qualified Inspector (Inspector) to issue an Application for Windstorm Inspection Certificate of Compliance (WPI-1) form for each building, review exterior architectural and mechanical envelope assembly submittals, conduct periodic inspections of the installation of the exterior envelope assemblies, issue reports of finding of field inspections, conduct follow up inspections as deemed necessary by the Inspector and shall issue Inspection Verification (WPI-2) forms for each building. The Contractor shall include copies of each form and a final copy of the Windstorm Certificate of Compliance (WPI-8) form for each building with the substantial completion close-out documents.

1.1 CONTRACTOR'S DELEGATED RESPONSIBILITY – TDI WINDSTORM CERTIFICATION PROGRAM

B. The Contractor is solely responsible for all activities, scheduling, safe access, and communication to achieve a windstorm certificate (WPI-8) from the TDI for the building's contracted envelope repairs, replacements, and alterations. The contractor shall provide all construction services as needed to satisfy the requirements of the construction drawings and specifications, the referenced building code (International Building Code, 2018) and the TDI windstorm inspection program. The contractor shall contract with an Appointed Qualified Inspector (Inspector) as defined by the TDI windstorm program to provide field inspection services throughout construction. All construction administration costs, submittal preparation costs, submittal review by the Inspector costs, inspection costs, inspection coordination, including all general conditions, overhead and profit shall be included in the contractor's bid.

C. The Contractor's Inspector shall submit an application for Windstorm Inspection Certification of Compliance (WPI-1) form to the TDI for each individual building. The WPI-1 shall be issued within 30 days of Notice to Proceed, and shall be made available to the Owner, Architect and Authority Having Jurisdiction for construction permit applications as requested.

D. The contractor shall make available all exterior envelope assembly submittals to their Inspector for windstorm construction compliance review and comment. Exterior envelope assembly submittals may include but are not limited to the following general items:

1. Roofing assemblies
2. Edge of roof details and parapet coping detail assemblies
3. Soffit assemblies
4. Roof mounted equipment curbs and attachment assemblies
5. Wall mounted mechanical louvers and attachment assemblies
6. Exterior wall cladding and finish assemblies
7. Exterior doors and hardware assemblies
8. Exterior overhead doors and hardware assemblies
9. Exterior windows and storefront assemblies

E. The Contractor and Inspector shall review submittals for compliance with the tested performance requirements noted in the IBC, 2018 for all door, window, storefront, wall cladding, roofing system, soffit and mechanical louver and roof mounted equipment assemblies. The contractor shall provide within the submittal substantiating product evaluation reports or tested assembly reports that confirm the tested performance requirements of the IBC are satisfied by the submitted assemblies.

F. The Contractor shall coordinate appropriate inspections with the Inspector required to verify compliance of windstorm construction requirements as detailed by the TDI windstorm inspection program. The contractor and Inspector shall be responsible for the timing of the inspection and safe access to the site to accommodate the needs of the Inspector throughout the entire construction.

G. The Contractor and Inspector shall rely on the signed and sealed contract drawings as an indication that the inspected buildings were designed in compliance with the International Building Code, 2018 edition. Any delegated design responsibilities of individual assemblies or components shall be the responsibility of the contractor as indicated on the contract drawings and specifications.

H. The Contractor and Inspector shall provide site inspection reports to the Owner and Architect indicating compliance with installation details of exterior envelope assemblies or written remedial measures required by the Contractor to get inspected works in the field into compliance with submitted assembly installation details.

I. The Contractor and Inspector shall provide a list of expected site inspections to the Owner and Architect within 30 days of the Notice to Proceed date. The inspection list shall identify the work in the field to be inspected and indicate the sequence of work at which time the Inspector will need to be present to observe the installed work prior to it being concealed by subsequent trade activities and material installation.

J. The Contractor and Inspector shall conduct all windstorm inspections and activities required for certification of the buildings through the TDI Windstorm Certification program independent of all Architectural and Engineering Design Team field observations. The Contractor and/or the Inspector shall not rely on contract administration services from the Design Team as substitution for any delegated windstorm inspection service required by the TDI windstorm certification program and/or delegated within the contract documents to the Contractor.

K. The contractor shall include a copy of the WPI-1, WPI-2 and WPI-8 forms for each individual building with all other substantial completion close-out documents. The contractor shall not rely on the WPI-2 from the Inspector as a means to satisfy this delegated responsibility. The windstorm inspection services delegated responsibility shall be considered incomplete until the Contractor delivers a copy a of the WPI-8 Certificate of Compliance for each individual building under contract.

L. Should the project, Inspector or individual building be selected by the TDI for quality control auditing of the Inspector’s work, the Contractor and Inspector shall be responsible for all time, documentation and field inspections requested by the TDI windstorm program to satisfy the audit requirements.

END OF SECTION 011100

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Contingency allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.6 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. **Allowance No. 1**: Contingency Allowance: Include a contingency allowance of $40,000.00 for use according to Owner's written instructions.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 DEFINITIONS

A. Alternate: An amount proposed by bidders for certain work that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.2 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate. Acceptance of Alternates will be exercised at option of Owner in any order or combination.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No #1: At World Scholars (Edinburg) in Administration Area, Ductwork Replacement – Full replacement of ductwork within the Administration Area served by existing CHW RTU-3. Work shall include new ductwork, new supply and return air, air devices, grilles, registers, diffusers, new zone dampers, and associated controls as indicated on the drawings. The work shall also include the temporary removal and reinstallation of existing ceiling tiles, ceiling grid, and all ceiling-mounted MEP devices, including but not limited to light fixtures, speakers, fire alarm devices, sensors, and other ceiling-mounted components as required to complete the ductwork replacement.

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions (ASI) authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1. Work Change Proposal Requests (PR) issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within 10 days after receipt of Proposal Request, 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.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. 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.

1.6 WORK CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive on EJCDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work 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 Work 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 012600

SECTION 012900 - 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 items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

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

1. Arrange schedule of values consistent with format of AIA Document G703.
2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site.

4. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
6. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
8. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

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.

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.

C. Payment Application Times: Submit Application for Payment to Architect by the third week of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. 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 for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Submit three 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. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Sustainable design action plans, including preliminary project materials cost data.
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, 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.
5. AIA Document G706A.
6. AIA Document G707.
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. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - 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. RFIs.
4. Digital project management procedures.
5. Project meetings.

1.2 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, telephone number, and email address 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.

1.3 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. 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. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated 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. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative 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 Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:

    a. Same digital data software program, version, and operating system as original Drawings.

2. File Submittal Format: Submit or post coordination drawing files using PDF format.
3. 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. Contractor shall execute a data licensing agreement in the form of AIA Document C106 or Agreement form acceptable to Owner and Architect.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Owner name.
2. Owner's Project number.
3. Name of Architect.
4. Architect's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. 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 three days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's **CAD drawings** will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.

3. Contractor shall execute a data licensing agreement in the form of AIA Document C106 or Agreement form acceptable to Owner and Architect.

    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106 or agreement acceptable to Owner and Architect.

B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project management software includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Track status of each Project communication in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.
    l. Mobile device compatibility, including smartphones and tablets.

2. Provide up to seven web-based Project management software user licenses for use of Owner**,** Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
4. Provide one of the following:
    a. Newforma, Inc.
    b. Procore Technologies, Inc.
    c. Submittal Exchange

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Architect and Owner will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. 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.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Sustainable design requirements.
    o. Preparation of Record Documents.
    p. Use of the premises.
    q. Work restrictions.
    r. Working hours.
    s. Owner's occupancy requirements.
    t. Responsibility for temporary facilities and controls.
    u. Procedures for moisture and mold control.
    v. Procedures for disruptions and shutdowns.
    w. Construction waste management and recycling.
    x. Parking availability.
    y. Office, work, and storage areas.
    z. Equipment deliveries and priorities.
    aa. First aid.
    bb. Security.

cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for 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, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

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.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.

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:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site use.
        10) Temporary facilities and controls.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Status of RFIs.
        16) Status of Proposal Requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.
3. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion and final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 30 days for startup and testing.
4. Commissioning Time: Include no fewer than 30 days for commissioning.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion and the following interim milestones:

1. Temporary enclosure and space conditioning.
2. Commissioning

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.

4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.7 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and inspection.
    j. Commissioning.
    k. Punch list and final completion.
    l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

1.8 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final completion construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within five days of taking photographs.

1. Submit photos thumb-drive and by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description web-based Project management software site:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.
g. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
1. Take photographs to show existing conditions or devices that are too remain that would be needed for documentation.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. HVAC Curb Installation
2. HVAC Unit Fastening to Curb
3. Roof Flashings at Curbs
4. HVAC Duct Installtion
5. General site activities that illustrate work progress

E. Periodic Construction Photographs: Take 10 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take 15 photographs after date of Substantial Completion for submission as Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.

11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals for Utilizing Web-Based Project Management Software: Prepare submittals as PDF files, or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal. Include all items as a complete package in Resubmittal. Incomplete submittals will be returned if only partial information is re-submitted.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's or Consultants action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.

e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit **one** full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of

assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.

d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp and indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

a. Reviewed No Exceptions

b. Reviewed As Noted

c. Revise and Resubmit

2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Architect will discard submittals received from sources other than Contractor.

E. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner and authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.

2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.

    a. Include each system, assembly, component, and part of the exterior wall to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.

3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
4. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
5. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall have the same meaning as testing agency.

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Statement: Submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Mockup Shop Drawings: For integrated exterior mockups.

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee

payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens and test assemblies, mockups, and do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspection will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.

6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section,

provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.

a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies

with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017050 - PROJECT CLOSEOUTS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF REQUIREMENTS:

Definitions: Closeout is hereby defined to include general requirements near the end of the Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Divisions 2 through 16. Time of closeout is directly related to “Substantial Completion", and therefore may be either a single time period for entire work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

PREREQUISITES TO SUBSTANTIAL COMPLETION:

General: Prior to requesting the Architect/Engineer's inspection for certification of substantial completion, (for either the entire work or for portions thereof), complete the following and list known exceptions in the request:

Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.

Obtain and submit releases enabling Owner’s full, unrestricted use of the work and access to services and utilities (where required), include occupancy permits, operating certificates, and similar releases.

Deliver tools, spare parts, extra stocks of materials, and similar physical items to the Owner.

Make final changeover of locks and transmit the keys to the Owner, and advise the Owner's personnel of change over in security provisions.

Complete start up testing of systems, and instructions of the Owner’s operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock ups, and similar elements.

Complete final cleaning up requirements, including touch up of painting of marred surfaces.

Inspection Procedures: Upon receipt of the Contractor's request Architect/Engineer will either proceed with inspection or advise Contractor of unfilled prerequisites. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed prior to the issuance of certificate; and repeat the inspection when requested and when assured that the work has been substantially completed. Results of the completed inspection will form the initial "punch list"

for final acceptance.

PREREQUISITES TO FINAL ACCEPTANCE:

General: Prior to requesting Architect/Engineer's final inspection for certification of final acceptance, and final payment, as required by the General Conditions, complete the following and list known exceptions, (if any), in request.

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.

Submit an updated final statement, accounting for final additional changes to the Contract Sum.

Submit certified copy of the Architect/Engineer’s final 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 Architect.

Submit consent of surety.

Re-inspection Procedure: Upon receipt of the Contractor's notice that the work has been completed, including punch list items resulting from earlier inspections, and accepting incomplete, items delayed because of acceptable circumstances, the Architect/Engineer will re-inspect the work.

Upon completion of re-inspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or obligations not fulfilled, as required for final acceptance. If necessary, procedure will be repeated.

RECORD DOCUMENT SUBMITTALS:

General: Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the "Submittals" sections. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire resistive location; provide access to record documents for Architect/Engineer's reference during normal working hours.

Record Drawings: Maintain a white print set (blue line or white prints of contract drawings and shop drawings in a clean, undamaged condition with mark up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark up, record a cross reference at the corresponding location on the working drawings. Mark with legible erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Verify colors will be visible during scanning of record drawings. Mark up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and

other identification on cover of each set.
Provide two electronic copies on CD of the record drawings to the Owner.

Record Specifications: Maintain one copy of specifications, including addenda, change orders and similar modifications issued in printed form during construction, and mark up variations (of substance) in the actual work in comparison with the text of the specifications and modifications as issued. 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. Upon completion of mark up, submit to Architect/Engineer for Owner's records.

Record Product Data: Maintain one copy of each product data submittal, and mark up significant variations in actual work in performed in comparison with the submitted information. Include both variations in product as delivered to site, and variations from the manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark up of record drawings and specifications. Upon completion of mark up, submit complete set to Architect/Engineer for the Owners' records.

Record Sample Submittal: Immediately prior to date(s) of substantial completion, the Architect/Engineer (and including Owner's personnel where desired) will meet with Contractor at site, and will determine which (if any) of submitted samples maintained by Contractor during progress of the work, are to be transmitted to the Owner for record purposes. Comply with Architect/Engineer's instruction for packaging, identification marking, and delivery to the Owner's sample storage area.

Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record keeping and submittals in connection with the actual performance of the work. Immediately prior to the date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect/Engineer for the Owner's records.

Maintenance Manuals: Organize maintenance and operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb tabbed). Include emergency instructions, spare parts listing, and copies of warranties, wiring diagrams, recommended "turn around" cycles, inspection procedures, shop drawings, product data, and similar applicable information. Bind each manual of each set of data in a heavy duty 2", 3 ring vinyl covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

PART 2 PRODUCTS (not applicable)

PART 3 EXECUTIONS

CLOSEOUT PROCEDURES:

General Operating and Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance or operation, to meet with Owner's personnel, at the project site, to provide basic instruction needed for proper operation and maintenance of the entire work. Include instructions by the manufacturer's representatives where installers are not experts in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start up, shut down, emergency operations, noise and vibration adjustments, safety, economy and efficiency adjustments energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds and similar continuing commitments.

FINAL CLEANING:

General: Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during the progress of the work is specified in General Conditions and as "Temporary Facilities" section of this Division. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples but not by way of limitation, of cleaning levels required.

Remove labels which are not required as permanent labels.

Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision obscuring materials. Replace broken glass and damaged transparent materials.

Clean exposed exterior and interior hard surface finishes to a dirt free condition, free of dust, stains, films and similar noticeable distracting substances. Except as other-wise indicated, avoid disturbance of natural weathering of exterior surface. Restore reflective surfaces to their original reflective condition.

Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.

Remove debris and surface dust from limited access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

Clean concrete floors in non occupied spaces broom clean.

Vacuum clean carpeted surfaces and similar soft surfaces.

Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

Clean food service equipment to a condition of sanitation ready and acceptable for intended food service use.

Clean light fixtures and lamps so as to function with full efficiency.

Clean project site (yard and grounds), including landscape development areas, of litter and foreign substances.

Sweep paved areas to a broom clean condition; remove stains, petro chemical spills and other foreign deposits. Rake ground which are neither planted nor paved, to a smooth, even textured surface.

Pest Control: Engage an experienced exterminator to make a final inspection of project and to rid project of rodents, insects, and other pests.

Removal of Protection: Except as otherwise indicated or requested by the Architect/Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

Compliance: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become Owner’s property, dispose of these materials to the Owner's best advantage as directed.

END OF SECTION 017050

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and one set of file prints.
3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit One paper-copy set of marked-up record prints.
2) Submit PDF electronic files of scanned Record Prints and one set of file prints.

B. Record Specifications: Submit annotated PDF electronic files and one paper copies of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories and one paper copies of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.

4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.

d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.

1. Submit video recordings thumb drive.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Basis-of-Design documentation is referenced for information only, and not included here.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Equipment and systems installation, startup, and field quality-control testing indicated in the Contract Documents.
5. Use of test equipment, instrumentation, and tools for commissioning.
6. System readiness checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
7. Commissioning tests and commissioning test demonstration.
8. Work to correct commissioning issues.
9. Work to repeat tests when equipment and systems fail acceptance criteria.
10. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submittal procedures requirements for commissioning.
2. Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.
4. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
5. Section 260800 "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, system readiness checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Basis-of-Design Document (BoD): A document prepared by Engineer, or Commissioning Authority that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority (CxA): An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.

E. Commissioning (Cx): A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of commissioning is defined in this section and is in accordance with the requirements in the IECC.

F. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

    a. Completion of tests and acceptance of test results.
    b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
    c. Comply with requirements in Section 017900 "Demonstration and Training."
    d. Completion and acceptance of submittals and reports.

G. Functional Test: Test of dynamic function of systems, as opposed to components, under full operation in various modes through all control system’s sequences of operation using manual (direct observation) or monitoring methods following prescribed test procedures in sequential written form

H. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

I. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

J. Construction or System readiness Checklist: List, provided by Commissioning Authority to installer, of items to inspect and elementary component tests to conduct to verify proper installation of equipment prior to functional testing.

K. Sampling: Functionally testing only a fraction of total number of identical or near identical pieces of equipment.

L. Seasonal Commissioning: Testing of equipment that can be done only during periods of peak heating or cooling, when HVAC equipment is operating at full-load or heavy-load conditions.

M. Simulated Condition: Condition created for purpose of testing response of system.

N. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

O. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

P. Trending: Monitoring using building control system.

1.4 COMPENSATION

A. Should Architect, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.

1. Failure to provide timely notice of commissioning activities schedule changes.
2. Failure to meet acceptance criteria for test demonstrations.

B. Contractor shall compensate Owner for such additional services and expenses at the rate of $150.00 per labor hour plus $100.00 per round trip plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority (CxA), plus consultants that CxA may deem appropriate for a particular portion of the commissioning.

a. CxA: Ethos Engineering, Mark Warren, PE. Cell (512) 563-3495

2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.

    a. Owner’s Rep: To be designated

3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

    a. Architect: See Specifications for Contact Information.

4. MEP Engineer, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

    a. MEP: Ethos Engineering, Guillermo Quintanilla. Cell (956) 564-2811.

1.6 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.
3. Contractor personnel and subcontractors to participate in each test.
4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed system readiness checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.

6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

F. System readiness checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.7 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Test data forms, completed and signed.
c. Commissioning issues report log.
d. Commissioning issues reports showing resolution of issues.
e. Correspondence or other documents related to resolution of issues.
f. Other reports required by commissioning.
g. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.
h. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.8 COMMISSIONING TEAM RESPONSIBILITIES

A. COMMISSIONING AUTHORITY: Responsibilities of the CxA during the Construction Phase include the following:
1. Coordinate and direct steps of the total Commissioning Process for systems being installed as part of this contract. Coordinate commissioning work schedule with Owner and Contractor.
2. Provide Commissioning Plan.
3. Attend planning and construction-site meetings as required to obtain information relating to Commissioning Process. Convene commissioning team meetings as required.
4. Plan and conduct commissioning scoping and coordination meetings. Provide notice to all Team members to attend scheduled commissioning meetings.
5. Request all information required for Commissioning Process from manufacturers, Contractor, and Design Professionals.
6. Verify that systems and equipment have been installed and started in accordance with manufacturer's recommendations and with generally recognized construction standards, and that documentation of such has been provided.
7. Assist in resolving discrepancies.

8. Prepare System readiness checklists to ensure systems have been installed according to project specifications. Verify that System readiness checklists have been addressed by Contractor and are accurate. Deliver final System readiness checklists to Owner.
9. Prepare Functional Test procedures to demonstrate performance of systems according to project specifications. Observe and document performance of systems, as per process detailed in Functional Test procedures.
10. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, system readiness checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
11. Prepare and maintain an Issues Log.
12. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.
13. Review testing and balancing (TAB) reports; notify Owner of deficiencies.
14. Recommend acceptance or non-acceptance of systems to Owner.
15. Verify that training has taken place by collecting training documentation from Contractor.
16. Compile and maintain commissioning record.
17. Provide pre-final and final commissioning reports to all commissioning team members. The report shall include:
    a. Communications between Owner, CxA, Design Professionals, Vendors, and/or Contractor and Subcontractors related to Commissioning Process.
    b. Minutes of commissioning meetings.
    c. Findings and pertinent observations.
    d. A listing of any deficiencies, unresolved issues, and compromises in the environmentally responsive features.
    e. Manufacturer's start-up reports.
    f. An Issues Log which:
        1) Describes design, installation, and performance issues which are at variance with the Owner's project requirements and Contract Documents.
        2) Identifies and tracks issues as they are encountered, documenting the status of unresolved and resolved issues.
        3) Documents corrective modifications made.
    g. System readiness checklists.
    h. Testing plans and Functional Test reports.
    i. Listing of off-season test(s) not performed and a schedule for their completion.
18. Conduct an inspection of the building and its systems within 10 months after substantial completion and prior to the expiration of warranties. Prepare a report documenting findings that should be addressed prior to expiration of warranties.

B. CONTRACTOR: Responsibilities of the General Contractor (GC) as related to Commissioning Process include, but are not limited to the following:
1. Facilitate coordination of Commissioning work by CxA.
2. Attend Commissioning meetings or other meetings called by CxA to facilitate the Commissioning Process.
3. Integrate and coordinate commissioning process activities with construction schedule.
4. Review CxA's Functional Test procedures for feasibility, safety, and impact on warranty, and provide CxA with written comment on same.

5. Provide all documentation relating to manufacturer's recommended performance testing of equipment and systems.
6. Provide Operations and Maintenance Data to CxA for preparation of checklists and training manuals.
7. Provide testing and balancing report.
8. Provide As-built drawings and documentation to facilitate Functional Testing.
9. Assure and facilitate participation and cooperation of specialty subcontractors (electrical, mechanical, Building Automation, etc.), and equipment suppliers as required for the Commissioning Process.
10. Require subcontractors to inspect systems installed and fill-out System readiness checklists (provided by CxA) to verify installation has taken place in accordance with manufacturer's instructions, and in a workmanlike manner in accordance with project documents and generally accepted construction practices. Certify to CxA that installation work listed in System readiness checklists has been completed and accompany CxA during verification of completed System readiness checklists.
11. Install systems and equipment in strict conformance with project specifications, manufacturer's recommended installation procedures, and System readiness checklists, as prepared by CxA.
12. Provide data concerning performance, installation, and start-up of systems.
13. Provide copy of manufacturer's filled-out start-up forms for equipment and systems.
14. Ensure systems have been started and fully checked for proper operation prior to arranging for Functional Testing with CxA. Prepare and submit to CxA written certification that each piece of equipment and/or system has been started according to manufacturer's recommended procedure, and that system has been tested for compliance with operational requirements.
    a. GC shall carry out manufacturer's recommended start-up and testing procedures, regardless of whether or not they are specifically listed in CxA's Functional Test procedures.
    b. GC is not relieved of obligation for systems / equipment demonstration where performance testing is required by specifications, but a Functional Performance Test is not specifically designated by CxA.
15. Coordinate with CxA to determine mutually acceptable date of Functional Performance Tests.
16. Review and accept construction checklists provided by the CxA.
17. Direct and coordinate commissioning testing among subcontractors, suppliers, and vendors.
18. Complete commissioning process test procedures.
19. Provide qualified personnel to assist and participate in Commissioning.
20. Provide test instruments and communications devices, as prescribed by CxA and where identified in this specifications manual, as required for carrying out Functional Testing of systems.
21. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
22. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
23. Ensure deficiencies found in the Commissioning Process are corrected within the time schedule shown in the CA report.
24. Provide CxA with all submittals, start-up instructions manuals, operating parameters, and other pertinent information related to Commissioning Process. This information shall be provided directly to the CxA as a digital PDF file at the same time that the submittals are made to the architect and/or engineer.
25. Prepare and submit to CxA proposed Training Program outline for each system.

26. Coordinate and provide training of Owner's personnel. Provide CxA with proposed training agenda no less than 14 days prior to scheduled training sessions. Provide documentation that training took place (including system being trained on, trainer's name and contact information, sign-in sheet verifying who attended training, length of training, and signature of owner's authorized person certifying training took place satisfactorily).
27. Prepare Operation and Maintenance manuals and As-Built drawings in accordance with specifications; submit copy to CxA in addition to other contractually required submissions. Revise and resubmit manuals in accordance with Design Professionals and CxA's comments.
28. All costs associated with the participation of GC, Sub-Contractors, Design Professionals, and Equipment Vendors in the Commissioning Process shall be included as part of the Construction Contract.

C. Subcontractors and vendors shall prepare and submit to Commissioning Authority Manufacturer's installation and performance test procedures to demonstrate performance of systems according to these specifications and checklists prepared by Commissioning Authority.

D. Owner's Representative: Responsibilities of the Owner's Representative as related to Commissioning Process include, but are not limited to the following:

1. Provide the OPR documentation to the CxA and GC for information and use.
2. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
3. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and GC for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
4. Manage contracts of Architect and GC.
5. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
6. Provide final approval for completion of Commissioning Work.
7. Warranty Period: Ensure that seasonal or deferred testing and deficiency issues are addressed.

E. Architect: Responsibilities of the Architect as related to Commissioning Process include, but are not limited to the following:

1. Attend commissioning scoping meeting and other commissioning team meetings as requested by Commissioning Authority and as selected by Architect.
2. Perform normal submittal review, construction observation, record drawing preparation, and operations and maintenance data preparation, as required by Contract Documents.
3. Coordinate resolution of system deficiencies identified during commissioning, as required by Contract Documents. Review Commissioning Issues Logs and issue directives to GC and/or Design Professionals as applicable.
4. Prepare and submit final as-built design intent documentation for inclusion in Operation and Maintenance Data Manual, and review and approve Operation and Maintenance Data Manual.
5. Review Commissioning Report and issue directive to resolve all outstanding deficiencies prior to project close-out.
6. Warranty Period: Coordinate resolution of design non-conformance and design deficiencies identified during warranty period commissioning.

F. Design Professionals Responsible for Design of Each Portion of Work Being Commissioned:

1. Perform normal submittal review, construction observations, and record drawing preparation, as required by Contract Documents. Perform site observation immediately preceding system startup.
2. Respond to deficiencies identified by Commissioning Authority as directed by Architect.
3. Provide design narrative and sequence documentation requested by Commissioning Authority. Assist, along with GC, in clarifying operation and control of commissioned equipment in areas where specifications, control drawings, or equipment documentation are not sufficient for writing detailed testing procedures.
4. Attend commissioning scoping meetings and other commissioning team meetings as requested by Commissioning Authority and as selected by Architect or responsible design professional.
5. Participate in resolution of system deficiencies identified during commissioning, as required by Contract Documents.
6. Prepare and submit final as-built design intent and operating parameters documentation for inclusion in Operation and Maintenance Manual, and review and approve Operation and Maintenance Manual.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.

2.2 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

a. Test specification.
b. Pre-startup reports.
c. Test data forms, completed and signed.

d. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary system readiness checklists and preliminary test procedures and data forms.

3.2 GENERAL

A. Authority
1. The Commissioning Authority carries out the Cx responsibilities as the Owner's authorized agent in accordance with plans, specifications, and contractual requirements.
2. CxA reports deficiencies found to the GC, Architect and Owner.
3. The Architect evaluates deficiencies and issues directive to GC to remedy CxA's deficiencies lists, in accordance with contract documents.
4. No change in scope work is to take place without express written consent of Owner. Any deficiencies identified by CxA that are deemed by Architect to be outside of the scope of work shall be discussed with Owner for consideration.
5. GC and CxA are to copy Architect on all correspondence related to the commissioning process.

B. Participation In The Commissioning Process
1. GC shall attend meetings related to Commissioning process and arrange for attendance by subcontractors and vendors prior to commissioning of their systems, at the discretion of CxA.
2. Provide skilled technicians to start and test all systems, and place systems in complete and fully functioning service in accordance with contract documents and design intent.
3. Provide skilled technicians, experienced and familiar with systems being commissioned, to assist CxA in commissioning process.
4. Attend initial commissioning team scoping meeting, pre-commissioning meetings specific to each system, and other meetings requested by CxA as required to discuss resolution of deficiencies.
5. Coordinate with sub-Contractors and equipment vendors/representatives to set aside adequate time to address System readiness Checklists, Functional Testing, Operations and Maintenance Training, and associated coordination meetings.

C. Work Prior To Testing
1. A commissioning team scoping meeting shall be held at a time and place designated by Commissioning Authority. Owner, Architect, Commissioning Authority, Contractor, and Mechanical, Electrical, and Controls Contractors, shall be present at this meeting. The main objectives of the meeting are to familiarize all parties with the requirements of the commissioning process; to ensure that the responsibilities of each party are clearly

understood; and obtain information to develop the preliminary commissioning plan, including:

a. Personnel representing the various entities participating in the process (GC, subcontractors, Owner, Architect, Engineer, CxA)
b. Lines of communications;
c. Assignment of responsibilities;
d. Review system readiness checklists;
e. Submittal schedule;
f. Preliminary construction schedule

2. Following the initial commissioning team scoping meeting, and upon reviewing submittals, CxA shall prepare a preliminary Commissioning Plan outlining procedures and responsibilities, including names and contact information of responsible parties, tentative dates for commissioning activities, and system readiness checklists. Preliminary Commissioning Plan shall be distributed to GC and Owner electronically for review and comment. CxA shall modify the Commissioning Plan based on feedback from GC and Owner and will generate a final Cx Plan.
3. Prior to system readiness and functional testing, CxA will conduct site inspections at critical times and issue Cx Field Reports with observations on installation deficiencies so that they may be issued by Architect as deemed appropriate
4. GC shall complete all phases of the work so the systems can be started, tested, adjusted, balanced, and otherwise commissioned.
5. GC shall verify requirements of Divisions 22, 23 and 26 outlining responsibilities for start-up of equipment with obligations to complete systems, including all sub-systems so that they are fully functional.
6. A minimum of fourteen (14) days prior to date of system readiness performance test, submit to Commissioning Authority for review, detailed description of equipment start-up procedures which GC proposes to perform to demonstrate conformance of systems to specifications and commissioning checklists.
7. Convene system-specific pre-commissioning meetings prior to start of system readiness testing of each system. The GC shall hold a pre-commissioning meeting with all Team members in attendance. The purpose of the meeting is to review the system readiness checklists, and equipment start-up procedures for each system to be commissioned, confirm that systems are ready for testing, and define a schedule for testing activities.

D. System readiness checks and functional performance tests

1. The GC shall provide all materials, services, and labor required to operate equipment and/or system in order to perform the system readiness checks and functional performance tests. A system readiness check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating commissioning team member of which participation is specified is not present for the test. The GC shall reimburse the Owner and A/E for all costs associated with effort lost due to tests that are aborted. These costs shall include salary, travel costs and per diem (where applicable).
2. Functional performance tests may sometimes duplicate the checking, testing, and inspection methods established in related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide required information. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section without the approval of CxA.

3. Follow start-up and initial checkout procedures listed in article titled "RESPONSIBILITIES" in Part 1, and additional requirements specified in this Section. Divisions 22, 23 and 26 have startup responsibilities and are required to complete systems and sub-systems so systems are fully functional, meeting design requirements of Contract Documents. Commissioning procedures and functional testing do not relieve or lessen this responsibility or shift this responsibility, in whole or in part, to Commissioning Agent or Owner.

E. Work To Resolve Deficiencies
1. Complete corrective work in a timely manner to allow expeditious completion of commissioning process. If deadlines pass without resolution of identified problems, Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs thus incurred will be GC's responsibility.

3.3 SUSTAINABILITY REQUIREMENTS

A. Comply with requirements listed in specifications and drawings as it relates to sustainability features that will be verified during the Commissioning process.

3.4 SYSTEM READINESS CHECKLISTS

A. General
1. System readiness checklists are important to ensure that equipment and systems are properly connected and operational, and installed in accordance with specifications, drawings, manufacturer's requirements, and all applicable codes.
2. Checklists ensure that functional performance testing (in-depth checkout) may proceed without unnecessary delays.
3. Performance of system readiness checklists, startup, and checkout shall be directed and executed by subcontractor or vendor. Only individuals that have direct knowledge and who witnessed that line item task on system readiness checklist was performed shall initial or check item off.
4. Each piece of equipment and major distribution system receive full system readiness checkout. No sampling strategies are used.
5. System readiness checkout for given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of given system.

B. System readiness Checklist
1. System readiness performance tests shall be documented in a checklist format, as prepared and provided by CxA, for each piece of equipment. Each checklist shall be initialed by GC, verifying that all items on checklist have been addressed and completed.
2. Commissioning System readiness checklists are not to preclude GC from applying his own construction inspection checklists.
3. All system elements shall be checked to verify that they have been installed, adjusted, and calibrated properly, that all connections have been made correctly, and that it is ready to function as specified. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, control sequence, and other conditions which may cause damage.
4. Verify that tests, meter readings and specific electrical characteristics agree with those required by equipment or system manufacturer.

5. All discrete elements and sub-systems shall be adjusted and shall be checked for proper operation. Verify wiring and support components for equipment are complete and tested.
6. Do not conduct start-up procedure recommended by equipment/system manufacturer at prior to system readiness testing.
7. Subcontractors shall clearly list outstanding items of initial start-up and system readiness procedures that were not completed successfully at bottom of procedures form or on separate sheet attached to form. Completed forms and attached sheets shall be provided to Commissioning Authority within 2 days of test completion. Installing subcontractor or vendor shall correct deficient or incomplete areas in timely manner and shall submit updated system readiness checklist and startup report with statement of correction on original non-compliance report.
8. When system readiness checklists for a particular system or subsystems are completed, GC will request verification by CxA. GC and subcontractors shall accompany CxA during system readiness checklist verification.
9. If during system readiness checklist verification, CxA finds a significant number of deficiencies, GC shall have all the checklists associated with similar system redone.

3.5 SYSTEM START-UP

A. GC will arrange for start-up of operating equipment and systems after (or at the same time as) system readiness testing and prior to scheduling Functional Testing.

B. Start-up of equipment and systems shall be performed only by a manufacturer's representative, or person(s) who are specifically manufacturer-approved. All start-up personnel shall be trained and authorized, experienced and knowledgeable in the operations of such equipment and systems.

C. Coordinate schedule for start-up of various equipment and systems so that subsystems required for major systems operation are tested first.

D. Manufacturer's start-up reports must be submitted to CxA prior to scheduling Functional Testing.

3.6 FUNCTIONAL TESTING

A. The objective of Functional Testing is to demonstrate that each system is operating according to documented design intent and Contract Documents, through all possible modes of operation.

B. GC and sub-Contractors shall include in his bid proposal all costs associated with preparation and execution of Testing Procedures for all systems to be commissioned.

C. Functional testing is intended to begin upon completion of each system and after system readiness checklists have been completed. Functional testing may proceed prior to completion of systems or sub-systems at discretion of Commissioning Authority. Beginning system testing before completion does not relieve GC from fully completing system, including system readiness checklists as early as possible.

D. GC and sub-Contractors shall provide detailed Testing Procedures that will allow all items on checklists to be verified.

E. Testing shall be conducted under specified operating conditions as recommended or approved by Commissioning Authority.

F. A Functional Performance Test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of Commissioning Authority in accordance with proposed test procedures developed to demonstrate compliance with specifications.

G. Each Functional Test shall be witnessed and signed off by Commissioning Authority upon satisfactory completion. Functional Test is not to be considered complete until Owner accepts Commissioning Authority's recommendation for completion.

H. All elements of system shall be tested to demonstrate that total systems satisfy all requirements of these specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each subsystem, followed by the entire system, followed by any inter-ties to other major systems.

I. Notification, Scheduling Of Functional Testing and Re-Testing
   1. Notify CxA and Owner, in writing, of request for scheduling Functional Testing. Submit request no fewer than five days prior to desired date for beginning functional testing.
      a. GC must certify that systems and equipment are functioning satisfactorily, according to specifications and design intent, prior to requesting Functional Testing. Upon receipt of such certification, CxA will schedule with GC a time for the particular system test.
         1) CxA will attempt to schedule Functional Testing when convenient for GC and his vendors, and to minimize lost time to GC.
      b. GC will resolve all deficiencies identified during initial test prior to submitting request, in writing, for re-testing. Such request for re-testing shall certify that GC has resolved all deficiencies, or list reason why any deficiencies remain which cannot be resolved.
      c. CxA will re-test to ensure that all deficiencies have been resolved.
         1) Deficiencies that were not detected in first Functional Test, but are discovered in subsequent re-testing, are to be resolved by GC as if they had been discovered in initial testing.

J. Functional Testing Requirements And Procedures
   1. GC and sub-Contractors shall perform tests in the presence of CxA. Tests not witnessed by CxA shall not be considered complete.
   2. To facilitate Functional Testing, when requested by CxA, GC shall provide services of personnel to accompany CxA for the duration of Functional Testing, including any follow-up testing. Such personnel must be experienced, qualified, and intimately familiar with the system being tested.
      a. Participation by representative(s) of direct digital controls (DDC) systems is of particular importance in Functional Testing. All systems which are controlled and/or monitored by DDC are to be thoroughly tested, point by point, through all modes of operation, with the assistance of manufacturer's representative. DDC graphics, setpoints, and programming are to be included as a part of Functional Testing as well.
      b. GC must provide services of personnel to accompany CxA for equipment and systems which may pose particular health and safety concerns, such as boilers.
      c. Should he fail to provide representative to accompany CxA during Functional Testing, GC continues to bear full responsibility for equipment warranty. Owner

and CxA will not be held responsible for damage to equipment, or other actions which might impact warranty, when performing Functional Testing of systems where GC has not provided authorized accompanying representative to operate equipment.

3. Each system shall be operated through all modes of operation including, but not limited to seasonal, occupied, unoccupied, warm-up, cool-down, part-load, and full-load, where system response is specified.
    a. For multiple units, sampling strategy established by Commissioning Authority and subject to approval of Owner may be used.
    b. Verification of each sequence in sequences of operation is required.
    c. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, and the like, shall also be tested.
4. Where possible, inspections carried out on systems by local Authorities Having Jurisdiction (AHJ) may serve as Functional Testing for purposes of Commissioning.
    a. CxA will accompany AHJ during testing procedures required by AHJ.
    b. It is responsibility of GC to arrange for testing by AHJ and to coordinate with CxA to find mutually convenient times for testing. Provide CxA a minimum of four days in advance of intent to schedule testing by AHJ.
    c. CxA will issue a separate report on results of testing.
    d. CxA reserves the right to require additional testing, should testing by AHJ not adequately cover all system components in all modes of operation.
5. Functional Testing is to be dedicated solely to testing of equipment and systems, and not to resolution of deficiencies. Deficiencies identified during testing process must be corrected by GC at a time other than during Functional Testing.
6. Within six days of performing functional test, CxA will issue test report with findings a list of deficiencies that must be addressed by GC or sub-Contractors.
7. Commissioning Authority shall submit a Final Report to Owner recommending acceptance or non-acceptance of individual system components as well as the systems as a whole.

K. Re-Testing And Failure To Remedy Deficiencies
1. Despite GC's best efforts to ensure systems are problem-free, it is expected that some deficiencies will be found during initial inspection of System readiness Checklist, and during initial Functional Testing; such deficiencies are expected to be minimal.
2. It is GC's responsibility to remedy identified deficiencies, both in System readiness Checklist and in Functional Testing phases of work, in a timely and thorough manner.
3. It is GC's responsibility to ensure that all deficiencies are corrected prior to requesting a re-inspection or re-test of systems and equipment. Do not request re-inspection or re-test until deficiencies are corrected.
    a. At his discretion, CxA may agree to re-testing systems or equipment where deficiencies remain which are beyond GC's control to resolve expeditiously.
    b. Typically such re-testing of incomplete systems and equipment will take place only if remaining deficiencies are minor in scope and nature, and are of such nature that they cannot be resolved in a timely manner (such as those due to difficulties in obtaining parts, or where Owner has requested a change that has delayed work, etc.)
4. CxA will carry out a second re-inspection or re-test of systems and equipment subsequent to receiving GC's request.
    a. If CxA finds deficiencies identified in initial inspection or test have not been remedied (with exception of un-resolvable deficiencies noted above), and such

remaining deficiencies are significant enough to require additional inspection or re-testing, GC will be back-charged for CxA's expenses, per Article 1.5.

3.7 DEFERRED TESTING

A. "Seasonal Commissioning" pertains to testing during peak heating or cooling seasons when HVAC equipment is operating at full-load or heavy-load conditions. Initial commissioning will be done as soon as contract work is completed, regardless of season. Seasonal Commissioning under full- or heavy-load conditions other than the current season will be handled at later time by GC and CxA.
   1. If adequate load may be artificially placed upon heating or cooling equipment, CxA, at his discretion, may perform functional testing during non-peak load periods.
   2. GC is to provide services of personnel and participate in seasonal testing process in the same manner as he would in non-seasonal testing.
   3. Until off-season commissioning can be accomplished, Owner may retain an amount from GC's payment sufficient to cover the cost of off-season testing.

B. Unforeseen Deferred Tests: If any check or test cannot be completed due to building structure, required occupancy condition, or other reason, execution of checklists and functional testing may be delayed upon approval of Owner. Tests shall be conducted in same manner as seasonal tests, as soon as possible. Services of required parties will be negotiated. Make final adjustments to Operation and Maintenance Manuals and record drawings due to unforeseen deferred tests.
   1. GC is to provide services of personnel and participate in deferred testing in the same manner as he would for normal commissioning.
   2. Until deferred testing can be accomplished, Owner may retain an amount from GC's payment sufficient to cover the cost of deferred testing.

3.8 TRAINING

A. The following requirements are in addition to operation and maintenance requirements specified elsewhere in this specifications manual. GC shall be responsible for training coordination and scheduling, and ultimately to ensure that training is completed.

B. Scheduling
   1. Organize training to fit Owner's schedule and to optimize the learning experience. Limit continuous sessions to no more than four hours, or otherwise only as approved by Owner and/or Architect.
   2. Provide an outline of the proposed training agenda for review by Owner and CxA a minimum of 10 days prior to proposed date for training session.
   3. Provide CxA a minimum 5 days advance notice of intent to carry out a training session.
   4. The CxA will not be required to attend all training sessions for building personnel, but will attend selected sessions and monitor progress and content.
   5. No training will take place prior to successful completion of Functional Testing.

C. Training Materials
   1. Develop Training Manuals to meet requirements of individual equipment specification sections.

2. Operating and Maintenance Manuals alone are NOT considered training manuals. O&M Manuals may be used as reference, but shall not be considered to meet requirements for training materials.
3. Develop a detailed outline showing how training program will be organized, including classroom and hands-on training as required by individual specifications sections.
4. Provide with training materials, a quick-reference "how-to" index which will allow operators to easily access information included in Training Manuals and/or O&M Manuals. This reference will include, as a minimum; routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions.
5. Refer to individual equipment or system specifications for minimum material to be covered as part of the training program.

D. Documentation
1. All training sessions are to be fully documented. Document:
   a. Basic information on training session (name of system, time, date, and location of training, name of presenter, length of training session, etc.).
   b. Names of persons who attended the training session (provide a sign-in sheet).
   c. Signature from authorized Owner’s representative indicating that training took place and was satisfactory.
2. Provide CxA copy of sign-in sheet with training session documentation.

3.9 O&M MANUALS

A. Provide operation and maintenance manuals as specified in section 017700 Closeout Submittals, and as outlined in individual sections of Divisions 22, 23 and 26.

B. Provide CxA with a single copy of Operation and Maintenance Manuals for review. CxA’s copy of O&M manuals shall be submitted through Architect.

C. CxA shall review O&M Manuals and submit comments through the Architect.

3.10 SYSTEMS TO BE COMMISSIONED

A. Refer to commissioning specifications sections in Related Sections, including the following:
1. 230100 - COMMISSIONING OF MECHANICAL SYSTEMS: HVAC and Controls.
2. 260100 - COMMISSIONING OF ELECTRICAL SYSTEMS: Lighting and Lighting Controls.

END OF SECTION 019113

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural steel and grout.

DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Submit shop drawings of all structural steel members. Provide electronic (PDF) copies of each drawing. Shop drawings shall include fabrication piece drawings and field erection drawings. Structural construction drawings shall not be photocopied and submitted.

1.4 INFORMATIONAL SUBMITTALS

A. Provide electronic (PDF) copies of all required submittal information.

1. Qualification Data: For qualified Installer and fabricator.
2. Welding certificates.
3. Mill test reports for structural steel, including chemical and physical properties.
4. Source quality-control reports.

1.5 QUALITY ASSURANCE

Erector Qualifications: A qualified erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. In lieu of AISC certification, erector may, at the construction manager’s recommendation and request, provide an in-house quality control program indicating compliance with minimum steel erection quality control requirements noted in AISC 360 – 10 “Specification for Structural Steel Buildings”, Chapter N, subsection N2.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, under Building QMS Certification Program, Category BU. In lieu of AISC certification, fabricator may, at the construction manager’s recommendation and request, provide an in-house quality control program indicating compliance with quality control procedures meeting minimum fabrication requirements noted in AISC 360 – 10 “Specification for Structural Steel Buildings”, Chapter N, subsection N2.

Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

2. AISC 360, Specification For Structural Steel Buildings.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
4. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design."

E. Preinstallation Conference: Conduct conference at Project site.

1.6 FABRICATION

A. Fabricate structural steel according to AISC specifications and tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Shop Priming: Prepare surfaces according to SSPC-SP 2 or SSPC-SP 3. Shop prime steel to a dry film thickness of at least 1.5 mils. Do not prime surfaces to be embedded in concrete or mortar or to be field welded.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

W-Shapes: ASTM A 572/A 572M, Grade 50 (345), Fy = 50 KSI.

B. Plate, Bar, Channels, Angles Shapes: ASTM A 36/A 36M, Fy = 36 KSI.

C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing, Fy = 46 KSI.

D. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, Fy = 35 KSI.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Finish: Plain.

C. Threaded Rods: ASTM A 36/A 36M.

1. Finish: Plain.

D. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.3 PRIMER

Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

GROUT

Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

B. Fabrication shop shall have a minimum of three years experience in the field of steel fabrication. Steel erector shall have same minimum experience.

C. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.

D. Fabricate steel pipe columns with steel top plates drilled for connection bolts and welded to pipe with continuous fillet weld same size as pipe wall thickness.

1. Provide base plates as scheduled on construction documents.

SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

Shop prime steel surfaces except the following:

Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).

2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Liquid Penetrant Inspection: ASTM E 165.

2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.

4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

Joint Type: Snug tightened.

2. Joint Type (Pre-Engineered Frame): Bolted moment connection (turn-of-nut method)

Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data & Shop Drawings.

B. Comply with SDI Publication No. 29, "Specifications and Commentary for Steel Roof Deck

C. Comply with AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Sheet: ASTM A 653 structural steel, and as follows:

1. Zinc-Coating Weight: G60 MIN.

2.2 DECKING

A. Roof Deck: Fabricate panels from galvanized steel sheet without top-flange stiffening grooves and as follows:

1. Deck Profile: Type 1.5 A, narrow rib.
2. Profile Depth: 1.1/2 inch
3. Design Uncoated Steel Thickness: 22 GA (0.0295 inch)
4. Grade: Fy = 33 KSI

B. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) 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.

2.3 MISCELLANEOUS

A. Accessories: Manufacturer's recommended roof deck accessory materials

B. Submit shop drawings indicating roof deck material, gage, and finish. Shop drawings shall provide deck sheet lengths and attachment weld patterns and side lap fastener requirements.

PART 3 - EXECUTION

3.1 DECK INSTALLATION

A. Install 1.5 A, 22 gage roof deck panels and accessories according to SDI Publication No. 29. Using 5/8” puddle welds and #10 Tek side lap fasteners. Reference plans for fastening pattern. Fasten deck to perimeter angle using 5/8” weld at 6” o/c.

B. Place, adjust, align, and bear deck panels on structure. Do not stretch or contract side lap interlocks.

C. Place deck panels flat and square and weld to structure without warp or deflection.

D. Cut, reinforce, and fit deck panels and accessories around openings and projections as required in structural drawings.

F. Roof Deck Accessories: Install sump pans, sump plates, ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels. Weld to substrate.

G. Prepare and repair damaged galvanized coatings on both surfaces as required in structural drawings.

H. Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of painted deck panels.

END OF SECTION 053100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following: Factory fabricated roof curbs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

B. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Coordinate dimensions with shop drawings of equipment to be supported.

1.4 QUALITY ASSURANCE

A. Substitutions: Requests for substitution shall be submitted in writing at least 10 days prior to bid date and shall be accompanied by product literature and samples. No substitution will be permitted after bid date.

B. Standards: Comply with the following:
1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. G-90 galvanized steel with paint-grip coating.

B. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of 2” thickness, 1-1/2lb density, R8 value.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

D. Fasteners: Stainless steel metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

F. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.

G. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

H. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

I. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.2 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 16 gauge, galvanized steel with paint grip coating, with welded corners and with seams joined by continuous water and air-tight welds. Tack or spot welding is unacceptable.
1. All external welds shall be prepared and coated with corrosion inhibitor compound.
2. Curb walls shall be insulated with 1-1/2” thick, three-pound density insulation. Exposed edges shall be encapsulated to ensure no insulation erodes into the air stream. Insulation shall be either foil faced or coated with antimicrobial coating such that the fibers are not airborne over the life of the building.
3. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
4. Provide formed cants and base profile coordinated with roof insulation thickness.
5. The Manufacturer shall limit static pressure gain to .25 inches/water gauge
6. Fabricate units to minimum height of 18 inches, unless otherwise indicated.
7. Changes in airflow direction to be accomplished by 90-degree elbows with turning vanes.
8. Curbs shall be manufactured in one piece except when width exceeds 108”. If width exceeds 108”, the curb shall be designed with prefabricated joints for ease of installation. It will be manufactured in separate pieces with the number and length of the pieces determined by the total length of the unit. The Manufacturer shall supply drawings for assembly and installation.
9. Curbs shall provide full support of the new unit and shall include 3/8” gasketing.
10. Counter flashing shall extend over the original curb a minimum of 1” and be welded and weatherproof.

2.3 FINISHES, GENERAL

A. Surface preparation: Oil, grease and other deposits of surface contamination shall be removed by solvent or detergent washing. All surfaces must be clean, dry and free of any dirt, dust, grease, oil or other deleterious materials prior to coating. Care shall be taken to ensure surfaces remain clean before and during coating process.

B. Application system:
   1. Coating shall provide a standard 5 year manufacturer's limited warranty.
   2. Metal surfaces shall be finished with a corrosion protection system equal to one of the following:
      a. Energy Guard ZRU Primer. Finish coat shall consist of EnergyGuard DCC Cabinet Casing polyurethane coating. Coatings shall be applied by a certified applicator and shall result in a finish with an ASTMB117-90 salt spray rating of 10,000 hours.
      b. Prime coat of ICI Devran 201 Universal Epoxy Primer to thickness of not less than 3.0 mils DFT (dry film thickness) nor more than 8.0 mils DFT. Minimum recoat time for Devran 201 Universal Epoxy Primer is 3.5 hours at 77F with 80% relative humidity. Finish coat shall consist of Devthane 379 UVA Aliphatic Urethane Gloss Enamel applied to thickness of not less than 1.0 mils DFT nor more than 5.0 mils DFT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weather tight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

C. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

D. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counter flashing). Seal overlap with thick bead of mastic sealant.

E. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 077200

SECTION 077300 - WIND LOAD RATED ROOF CURBS AND RESTRAINT BRACKETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Design, construct, furnish and install roof curbs, brackets and related items to meet governing building codes, as demonstrated by comprehensive analysis that the load resisting capabilities meet or exceed requirements.

1.3 QUALITY ASSURANCE

A. Meet requirements of the International Building Code, ASCE Std 7, TDI, and other applicable codes for the location. This specification shall be a minimum requirement for wind load design consideration, and is not intended as a substitute for legislated, more stringent, national, state or local requirements.

B. Wind-induced forces shall be determined by governing code requirements. Coordinate Design Wind Pressure Requirements with Structural Engineer.
   1. Wind-generated force shall be reduced into an equivalent statically applied force.
   2. The statically applied force shall act in horizontal and vertical directions at the center of gravity of the rooftop mounted equipment, resulting in torsion, flexure, tension and shear forces that the wind restraint brackets shall be shown to be able to resist.

C. Install products in strict accordance with applicable codes and manufacturers' standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent shall apply.

1.4 SUBMITTALS

A. Manufacturer's statement showing that the curbs and wind load restraint brackets meet the applicable code requirements, signed and sealed by a licensed professional engineer (PE). Provide the following:
   1. Wind restraint calculations for all connections of rooftop-mounted equipment to roof curb, and roof curb to the structure.
   2. Drawings showing curbs, wind restraint bracket dimensions, make and model compatible with rooftop unit, including type of connection hardware required.

SECTION 077300 - WIND LOAD RATED ROOF CURBS AND RESTRAINT BRACKETS

PART 2 - PRODUCTS

2.1 ROOF CURBS AND RESTRAINTS

A. Approved manufacturers of roof curbs and wind load restraint brackets:
   1. Curbs Plus, Complete Curbs, Thybar Corporation.
   2. Others shall obtain a written pre-approval one week prior to bidding.

B. Products shall be made of a material (Prime G-90 galvanized steel or galvalume) compatible with roof curb and the rooftop unit base-rail material. Dissimilar metals shall not to be used.
   1. Fully welded mitered corners for wind load consideration
   2. Base flange attachments for securing curb to structure.
   3. Factory installed wood nailer for attachment of roofing material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Attach rooftop equipment to roof curbs with wind load restraint brackets of size, type and quantity as determined by equipment manufacturer.

C. Attach roof curb to the building structure at the curb base flanges. Base flange attachment options include anchor bolts, welded connections and mechanical fasteners.

D. Do not install wind load restraint brackets in a manner that will result in inadequate maintenance access, base-rail damage, or roof curb reduced weight carrying capacity.

E. Prior to performing installation of restraint brackets, notify Engineer of any conflicts with other trades or equipment that may result in undesirable contact due to inadequate space or other unforeseen conditions. Notify Engineer of any discrepancies between the specifications and field conditions or changes required due to specific equipment selection prior to installation.

F. Corrective work necessitated by discrepancies or conflicts after installation shall be at the contractor's expense.

3.2 INSPECTION

A. On completion of installation, inspect the completed system and report in writing any installation error or other faults in the system that could affect the wind load resistant capabilities of the roof top assembly.

B. The Contractor shall submit a report to the project designer, including the above report with consequent steps taken to properly complete the wind load restraint installation.

END OF SECTION

SECTION 220010 – SUMMARY OF PLUMBING WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 22 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, and is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Contract Documents were prepared for the Project by:
Ethos Engineering,
1126 South Commerce
Harlingen, Texas 78550
Phone Number: (956) 230-3435

C. Scope of Work: Refer to drawings for a detailed Scope of Work. Provide all materials and labor associated with new fully-operational plumbing systems for the project "STISD HVAC Project 26-27", including but not limited to the following:

1. Demolition Work:
   a. Demolish existing plumbing fixtures and piping as indicated and prepare services for new plumbing fixtures, otherwise cap and seal services at a concealed location.
   b. Coordinate with new work and retain existing plumbing lines that are to be reused.

2. New Work:
   a. With Architect and Structural Engineer coordinate saw cutting of floors as noted on drawings and as needed.
   b. Plumbing fixtures such as floor drains.
   c. Sanitary wastewater, and service line connections to site utilities.

1.3 ALLOWANCES

A. See Division 0 Specifications. Coordinate provision of LPG tank under Allowance.

1.4 COORDINATION

A. All plumbing work shall be done under sub-contract to a General Contractor. Plumbing Contractor shall coordinate all work through General Contractor, who is ultimately responsible for the entire project.

B. Prior to bidding, Plumbing Contractor shall coordinate all work in Division-22 for integration with civil work, mechanical work, electrical work, irrigation work and general construction. A

detailed list of inclusion and exclusions shall be provided to General Contractors at least three days prior to the end of the period set aside to request clarifications so that coordination of any missing items may be addressed and clarified by Architect/Engineer as needed.

1. Coordinate water line diameter, tap size, meter size and backflow preventer size with MEP Engineer. While meter size may be smaller, water line diameter, tap, backflow preventer sizes shall match or be larger than the connection sizes shown on Plumbing drawings. If the distance from the water mains is too large, upsize line, valve sizes to minimize pressure drops. Coordinate details with Engineer.

C. All electrical work required for operation of plumbing systems shall be coordinated through the General Contractor prior to bidding to ensure that all starters, disconnects, conduit and wiring are provided as part of the project. All components needed for a full operational installation of systems shall be provided.

D. All Building Automation Systems (BAS) required for operation of plumbing systems shall be coordinated through the General Contractor prior to bidding, to ensure that all equipment, materials, valves, sensors, devices and labor are provided as part of the project. All components needed for a full operational installation of systems shall be provided.

E. Plumbing Contractor shall coordinate and supervise installation of all controls systems, and coordinate with electrical contractors and equipment suppliers as needed. All components needed for a full operational installation of systems shall be provided.

F. Contractor shall coordinate with other divisions for power and control of plumbing systems. It is not the intent of this specification to dictate who will conduct work, only to state the requirements of conducting the work.

G. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

H. Coordinate with Div. 1 for work sequence and optimization of construction schedule.

I. Coordinate with Div. 21 for Fire Suppression System.

J. Coordinate with Div. 23 for Mechanical System.

K. Coordinate with Div. 26 electrical contractor for providing power to plumbing equipment, and for Fire Alarm Systems interface with plumbing systems.

L. Issue written notification of the following tasks and allow five (5) days for Engineer to respond and schedule an inspection as required. Failure to issue written notification may result in work having to be redone to allow for proper inspection. It is contractor's responsibility to make sure Engineer receives notification.

1. Upon completion of underground piping installation and prior to testing or covering up.
2. Upon completion of all water piping installation and prior to insulation and/or testing.
3. Upon completion of ductwork and prior to testing and insulating.
4. Above ceiling inspections prior to ceiling tile installation.
5. When ready to request manufacturer's start-up of each piece of equipment.
6. When ready for Substantial Completion Inspection.
7. When ready for Final Inspection.

M. General

1. The Contractor shall execute all work hereinafter specified or indicated on accompanying Drawings. Contractor shall provide all equipment necessary and usually furnished in connection with such work and systems whether or not mentioned specifically herein or on the Drawings.
2. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation and thereby to provide an integrated satisfactory operating installation.
3. The Mechanical, Electrical, Plumbing, and associated Drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of standards referenced elsewhere in these specifications, and structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All exposed work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
4. When the mechanical, electrical and plumbing drawings do not give exact details as to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

1.5 WORK SEQUENCE

A. Locate Utilities:

1. Coordinate with power, water, sewer, telephone, communications, and other utilities as well as designated Owner's personnel to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

B. Coordinate with Division 1 requirements to optimize construction schedule.

C. Provide equipment and material submittals, coordination drawings and shop drawings as required by specifications.

D. Submit detailed plumbing Schedule of Values with Submittals. Plumbing Submittals will not be accepted without a detailed Schedule of Values.

E. Sequence construction in coordination with work by other disciplines.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Driveways and Entrances: Keep driveways and entrances to construction site clear and available to other Contractors, Owner, and A/E personnel at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

A. Manufacturer's standard dimensioned drawings, performance and product data shall be edited to delete reference to equipment, features, or information which is not applicable to the equipment being supplied for this project.

B. Provide all plumbing submittals at the same time in one or multiple bound volumes. Include originals from manufacturer. All submittals shall be in native pdf and searchable format. Faxes and copies of faxes are not acceptable.

C. Provide sufficient copies of approved data, with the engineer's approved stamp, for inclusion in the operations and maintenance manuals.

D. Provide detailed coordination drawings showing how plumbing system components will be installed in coordination with work by others. Engineer’s drawing files will be made available to Contractor for producing coordination and as-built drawings upon request.

1.8 SCHEDULE OF VALUES -Special Requirements

A. Plumbing Contractor shall submit a Schedule of Values reflecting the total value of Plumbing Work in the Contract, and broken down into the following items as a minimum, with a line-item for Materials/Equipment and another for Labor:

1. Plumbing fixtures and equipment
2. Plumbing materials
3. Plumbing labor
4. Allowances.
5. Miscellaneous
6. Administrative and project management.

B. Schedule of Values shall be included with bound submittals. Submittals without a Schedule of Values shall not be reviewed.

1.9 EQUIPMENT MANUFACTURERS

A. Plumbing design is based on equipment and materials scheduled and specified. These are used as the basis for performance characteristics, quality, and physical dimensions/weight.

B. Equipment and materials by other APPROVED manufacturers may be provided by Contractor. In doing so, Contractor assumes responsibility for the performance, quality, and physical dimensions of the proposed units.

C. Any costs associated with modifications to the design due to submittal of equipment and/or materials other than those used as the basis of design are the Contractor's responsibility. This includes any design time, production of drawings, and time delays.

D. Where use of equipment and/or materials other than those used as the basis of design impact other disciplines, Contractor shall assume responsibility for all costs associated with any APPROVED modifications. This may include resizing of electrical circuits, modifying openings in the structure, relocating floor drains, etc.

1.10 OPERATIONS AND MAINTENANCE MANUALS & TRAINING

A. Submit Operations and Maintenance Manuals two weeks prior to Substantial Completion Inspection. Engineer will not conduct a Substantial Completion Inspection without having reviewed Operations and Maintenance Manuals.

B. Use Operations and Maintenance Manuals as a guide for conducting training of Owner's personnel.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220010

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For sovent drainage system. Include plans, elevations, sections, and details.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Heavy-Duty, Hubless-Piping Couplings:

a. Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Shielded, Nonpressure Transition Couplings:
   a. Standard: ASTM C 1460.
   b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

4. Pressure Transition Couplings:
   a. Standard: AWWA C219.
   b. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
   c. Center-Sleeve Material: Stainless steel.
   d. Gasket Material: Natural or synthetic rubber.
   e. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
   a. Description:

      1) Standard: ASSE 1079.
      2) Pressure Rating: 150 psig.
      3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:
   a. Description:

      1) Standard: ASSE 1079.
      2) Factory-fabricated, bolted, companion-flange assembly.
      3) Pressure Rating: 150 psig.
      4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:
   a. Description:

      1) Nonconducting materials for field assembly of companion flanges.
      2) Pressure Rating: 150 psig.
      3) Gasket: Neoprene or phenolic.
      4) Bolt Sleeves: Phenolic or polyethylene.
      5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:
   a. Description:

      1) Standard: IAPMO PS 66
      2) Electroplated steel nipple.
      3) Pressure Rating: 300 psig at 225 deg F.
      4) End Connections: Male threaded or grooved.
      5) Lining: Inert and noncorrosive, propylene.

2.5 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install aboveground PVC piping according to ASTM D 2665.

O. Install underground PVC piping according to ASTM D 2321.

P. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

Q. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

H. Install supports for vertical PVC piping every 48 inches.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

A. Underground and above ground (unless noted otherwise), soil, waste, and vent piping shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

B. In Return Air Plenum: Soil, waste, and vent piping shall be the following:
   1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.

END OF SECTION 221316

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Urinals
8. Lavatories.
9. Kitchen sinks.
10. Service basins.

B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
3. Division 22 Section "Drinking Fountains and Water Coolers."
4. Division 31 Section "Facility Water Distribution Piping" for exterior plumbing fixtures and hydrants.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PMMA: Polymethyl methacrylate (acrylic) plastic.

H. PVC: Polyvinyl chloride plastic.

I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. 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.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
3. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
4. Vitreous-China Fixtures: ASME A112.19.2M.
5. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
6. Water-Closet, Flushometer Tank Trim: ASSE 1037.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Dishwasher Air-Gap Fittings: ASSE 1021.
4. Plastic Tubular Fittings: ASTM F 409.
5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Flexible Water Connectors: ASME A112.18.6.
2. Floor Drains: ASME A112.6.3.
3. Grab Bars: ASTM F 446.
4. Hose-Coupling Threads: ASME B1.20.7.
5. Off-Floor Fixture Supports: ASME A112.6.1M.
6. Pipe Threads: ASME B1.20.1.
7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures of unit shell.
b. Faulty operation of controls, blowers, pumps, heaters, and timers.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Chicago Faucets.
b. Elkay Manufacturing Co.
c. Moen, Inc.

2. Description: See plumbing schedule.

2.2 SINK FAUCETS

A. Sink Faucets:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Chicago Faucets.
b. Elkay Manufacturing Co.
c. Moen, Inc.

2. Description: See plumbing schedule.

2.3 FLUSHOMETERS

A. Flushometers:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Sloan Valve Company.
b. Zurn

2. Description: See plumbing schedule.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. American Standard Companies, Inc.
b. Bemis Manufacturing Company.
c. Kohler Co.

2. Description: See plumbing schedule.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. TRUEBRO, Inc.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.6 FIXTURE SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. MIFAB Manufacturing Inc.
2. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Watts Drainage.

B. Water-Closet Supports:

1. Description: See plumbing schedule.

C. Urinals Supports:

1. Description: See plumbing schedule.

D. Lavatory Supports:

1. Description: See plumbing schedule.

E. Sink Supports:

1. Description: See plumbing schedule.

2.7 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Crane Plumbing, L.L.C./Fiat Products.
b. American Standard Companies, Inc.
c. Zurn
d. Kohler
e. Toto USA.

2. Description: See plumbing schedule.

B. Urinals:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Crane Plumbing, L.L.C./Fiat Products.
b. American Standard Companies, Inc.
c. Zurn
d. Kohler
e. Toto USA.

2. Description: See plumbing schedule.

2.8 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. American Standard Companies, Inc.
b. Toto USA
c. Crane Plumbing, L.L.C./Fiat Products.

2. Description: See plumbing schedule.

2.9 KITCHEN SINKS

A. Kitchen Sinks:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Elkay USA
b. Acorn
c. Willoughby

2. Description: See plumbing schedule.

2.10 SERVICE BASINS

A. Mop Service Basim:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. American Standard Companies, Inc.
b. Toto USA
c. Crane Plumbing, L.L.C./Fiat Products.

2. Description: See plumbing schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

T. Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

U. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 230010 – SUMMARY OF MECHANICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 23 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, and is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Mechanical Contract Documents were prepared for the Project by:
Ethos Engineering,
1126 South Commerce Street
Harlingen, Texas 78550
Phone Number: (956) 230-3435

C. Scope of Work is broken down as follows:
1. Base Bid: Replacement of HVAC systems and controls.
   a. Demolish existing systems,
   b. Install Owner pre-purchased HVAC systems including DX RTUs, DX split systems, hydronic AHUs, VFDs, duct and piping modifications.
   c. Provide systems modifications including ductwork modifications, and related controls upgrades. See drawings for details.
2. Alternate #1: Replacement of air distribution systems, zone dampers, bypass dampers, ductwork, air devices, and related controls. Retain and reuse existing AHUs as indicated.

D. Scope of Work:
1. Base Bid: Scope of Work related to New Addition:
   a. Ductwork, diffusers, grilles, dynamic fire dampers, control dampers, zone dampers, OA intake louvers, and other accessories.
   b. Testing, Adjusting, & Balancing (TAB) shall not be provided under the mechanical contract. General contractor to provide TAB. Coordinate work.
   c. Expand existing Building Automation System and provide BAS controls per Sections 230900 and 230993. Coordinate with equipment manufacturer, and provide BACnet integration.
      1) RTUs come with integral controllers. BACnet interface will be used to integrate with BAS.
      2) Via BACnet BAS shall set time schedules, setpoints, and monitor additional parameters and alarm codes from RTU controllers. BAS shall send alarms/texts per specifications.
      3) Closely coordinate who will provide T/RH/CO2 sensors (BAS or equipment manufacturer). Provide and integrate adjustable limited-range thermostats. Connect to Central Operator's station via communications network.

4) Contractor is responsible for coordination of controls relays, contactors, power to DDC panels, and other controls equipment. Although contractor may coordinate with other trades to provide miscellaneous electrical and mechanical work, the final responsibility for achievement of control sequences lies with the mechanical contractor.

2. Base Bid: Scope of Work related to Refresh and Renovations:
   a. Demolition: Demolish listed equipment and materials. Retain and reuse HVAC equipment as designated.
      1) Remove refrigerant and deliver to Owner.
      2) Remove ACCU, electric duct heater, ductwork and accessories, controls systems, and miscellaneous equipment and materials. Remove piping connections, refrigerant piping and specialties, piping supports, insulation, etc. as indicated in plans to make room for new equipment.
   b. New Work:
      1) New HVAC systems such as ACCU, VAV boxes, air-distribution systems and ductwork modifications, ductwork, dampers, and duct accessories, and air devices. See drawings for details.
      2) For reused refrigerant piping, provide cleaning and vacuuming of existing refrigerant piping to be reused. Provide new refrigerant piping specialties, pipe insulation, jacketing, pipe supports, and miscellaneous accessories.
      3) Wash and clean existing AHU coils, clean drain pan, verify operation of dampers and actuators.
      4) Provide "CGM" controller, sensors, motorized damper actuators, and update graphics.
3. Alternate Bid: Scope of Work related to HVAC Replacements:
   a. Design Intent:
      1) Provide Campuswide Controls Upgrades including replacement of network engines and graphics package.
      2) Retain and reuse DX AHUs and replace ACCUs.
      3) For replaced ACCUs, and related AHUs, replace controls.
         a) BAS replacement for AHU/ACCU-C will be implemented under a separate contract related to interior renovations project. Coordinate work closely with Owner, Engineer, and Contractors, such that there is no duplication or omission of work.
   b. Demolition: Demolish listed equipment and materials. The Owner has the right of first refusal. Dispose of removed items that the owner no longer wishes to keep. Retain and reuse HVAC equipment as designated.
      1) Remove refrigerant and deliver to Owner.
      2) Remove HVAC equipment, electrical, and controls equipment, including air-cooled condensing units, controllers, controls sensors, existing damper-actuators, and miscellaneous equipment and materials. Remove piping connections, refrigerant piping and specialties, piping supports, insulation, etc. as indicated in plans to make room for new equipment.
      3) Save existing smoke detectors, wiring and safeties for reuse. Document devices that are not in working order.
   c. New Work:
      1) Replace HVAC, electrical, and controls equipment, related to air-cooled condensing units. Provide modification of refrigerant piping, insulation, controls, and electrical systems.
      2) Existing refrigerant piping may be reused, provided the sizes are appropriate and approved by manufacturer of equipment.

3) Where refrigerant piping is reused, provide cleaning and vacuuming of existing refrigerant piping to be reused. Provide new refrigerant piping specialties, pipe insulation, jacketing, pipe supports, and miscellaneous accessories.
4) Wash and clean existing AHU coils, clean drain pan, verify operation of dampers and actuators
5) For replaced ACCUs, replace BAS controllers for split systems with new "CGM" controllers, sensors, motorized damper actuators at AHUs, and update graphics. Recommission controls to ensure the original sequences are fully operational.
6) Campuswide Controls Upgrades:
   a) Replace existing NAE network engines with new "SNE" supervisory controllers.
   b) Update graphics package to "MUI" that is compatible with the Metasys server.
   c) Ensure that the entire IDEA McAllen campus operates under a seamless and standardized MUI interface to ensure consistency, usability, and long-term supportability across the portfolio.

4. Shop drawing submittals for all mechanical systems such as equipment, ductwork and piping, and coordination drawings for placing of mechanical systems in relation to work by other disciplines.
5. Provide windstorm restraints for exterior mounted equipment, along with sealed drawings and calculations showing that restraints meet IBC requirements.
6. Coordinate electrical work with Div. 26 as required.
7. Coordinate fire alarm related work with Fire Alarm Contractor. Provide smoke detectors, wiring and controls for units, 2000 cfm and larger, where none exist.
8. Painting: See Division 9 specifications. Paint all exposed piping, ductwork, insulation, hangers, accessories in interior exposed areas. Paint exterior pipe supports. Coordinate paint type, color and scope of work with Architect.
9. Commissioning: Provide assistance with commissioning services per specifications. This includes completing systems readiness checklists, performing functional testing, providing operator training, etc.

1.3 ALLOWANCES

A. Allowances are included in the Division 1 specifications.

1.4 WORK UNDER SEPARATE CONTRACTS

A. NA.

1.5 COORDINATION

A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, who is ultimately responsible for the entire project.

B. Prior to bidding, Mechanical Contractor shall coordinate all work in Division-23 for integration with TAB, plumbing, electrical, controls work and general construction. A detailed list of inclusion and exclusions shall be provided to General Contractors at least three days prior to the end of the period set aside to request clarifications so that coordination of any missing items may be addressed and clarified by Architect/Engineer as needed.

C. All electrical work required for operation of mechanical systems shall be coordinated through the General Contractor prior to bidding to ensure that all starters, disconnects, VFD's, conduit and wiring are provided as part of the project. All components needed for a full operational installation of systems shall be provided.

D. All controls required for operation of mechanical systems shall be coordinated prior to bidding, to ensure that all equipment, materials, sensors, devices and labor are provided as part of the project. All components needed for a full operational installation of systems shall be provided. Mechanical Contractor shall coordinate and supervise installation of all controls systems.

E. All questions, requests for information, submittals, and correspondence from the Div. 23 Contractor shall be submitted via the General Contractor, who will forward to the Architect, who will then forward to the Engineer.

F. Div. 23 Contractor shall not make any changes to design without written authorization from the Engineer. If changes are requested by the Owner, Architect, General Contractor, Suppliers, Manufacturers, or any others, Contractor should issue a written RFI for response by the Engineer.

G. Div. 23 Contractor shall issue seven days written notice prior to any activities that require the presence of the Engineer at the job-site. This applies to all inspections required by specifications, and particularly to those where work will be covered.

H. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Ensure that systems are ready for controls and electrical connections when needed so as to not delay construction.

I. Contractor shall coordinate with other divisions for power and control of mechanical systems. It is not the intent of this specification to dictate who will conduct work, only to state the requirements of conducting the work.

J. Coordinate with Div. 1 for work sequence and optimization of construction schedule.

K. Coordinate with Div. 21 for Fire Suppression System.

L. Coordinate with Div. 26 electrical contractor for providing power to mechanical equipment, and for Fire Alarm Systems interface with mechanical systems.

M. Coordinate TAB activities with TAB Contractor.

N. Coordinate commissioning activities with Commissioning Agent.

O. Issue written notification of the following tasks and allow five (5) days for Engineer to respond and schedule an inspection as required. Failure to issue written notification may result in work

having to be redone to allow for proper inspection. It is contractor's responsibility to make sure Engineer receives notification.

1. Upon completion of ductwork and prior to testing and insulating.
2. Metal duct leakage testing.
3. Above ceiling inspections prior to ceiling tile installation.
4. When ready to request manufacturer's start-up of each piece of equipment.
5. When ready for Systems Readiness Checklists (Commissioning).
6. When ready for Functional Performance testing (Commissioning).
7. When ready for an inspection by TAB contractor prior to developing detailed TAB Plan.
8. When ready to conduct complete Automation System software demonstration.
9. When ready for Substantial Completion Inspection.
10. When ready for Final Inspection.

P. General

1. The Contractor shall execute all work hereinafter specified or indicated on accompanying Drawings. Contractor shall provide all equipment necessary and usually furnished in connection with such work and systems whether or not mentioned specifically herein or on the Drawings.
2. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation and thereby to provide an integrated satisfactory operating installation.
3. The Mechanical, Electrical, Plumbing, and associated Drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of standards referenced elsewhere in these specifications, and structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All exposed work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
4. When the mechanical, electrical and plumbing drawings do not give exact details as to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

1.6 WORK SEQUENCE

A. Locate Utilities:

1. Coordinate with power, water, sewer, telephone, communications, and other utilities as well as designated Owner's personnel to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

4. Where several new utilities must share a common area or path, coordinate with other trades so that the proper clearances are maintained and utilities may be installed in compliance with all requirements.
5. Refer to Civil Plans for coordination of connection points from site utilities to buildings.

B. Coordinate with Division 1 requirements to optimize construction schedule.

C. Provide equipment and material submittals, coordination drawings and shop drawings as required by specifications.

D. Submit detailed mechanical Schedule of Values with Submittals. Mechanical Submittals will not be accepted without a detailed Schedule of Values.

E. Sequence construction in coordination with work by other disciplines.

1.7 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
1. Driveways and Entrances: Keep driveways and entrances to construction site clear and available to other Contractors, Owner, and A/E personnel at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:
1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.8 SUBMITTALS

A. Manufacturer's standard dimensioned drawings, performance and product data shall be edited to delete reference to equipment, features, or information which is not applicable to the equipment being supplied for this project.

B. Provide all mechanical submittals at the same time in one or multiple bound volumes. Include originals from manufacturer. All submittals shall be in native pdf and searchable format. Faxes and copies of faxes are not acceptable.

C. Provide sufficient copies of approved data, with the engineer's approved stamp, for inclusion in the operations and maintenance manuals.

D. Provide detailed coordination drawings showing how mechanical system components will be installed in coordination with work by others. Engineer's drawing files will be made available to Contractor for producing coordination and as-built drawings upon request.

1.9 SCHEDULE OF VALUES -Special Requirements

A. Mechanical Contractor shall submit a Schedule of Values reflecting the total value of Mechanical Work in the Contract, and broken down into the following items as a minimum, with a line-item for Materials/Equipment and another for Labor:

MECHANICAL

1. HVAC equipment
2. HVAC materials (ductwork, piping, dampers)
3. HVAC labor
4. Controls equipment
5. Controls labor
6. Controls engineering and programming
7. Controls commissioning and closeout (minimum 10% of total controls cost)
8. Controls training (minimum 5% of total controls cost)
9. TAB
10. Commissioning related activities
11. Allowances.
12. Miscellaneous
13. Administrative and project management.

B. Schedule of Values shall be included with bound submittals. Submittals without a Schedule of Values shall not be reviewed.

1.10 EQUIPMENT MANUFACTURERS

A. Mechanical design is based on equipment and materials scheduled and specified. These are used as the basis for performance characteristics, quality, and physical dimensions/weight.

B. Equipment and materials by other APPROVED manufacturers may be provided by Contractor. In doing so, Contractor assumes responsibility for the performance, quality, and physical dimensions of the proposed units.

C. Any costs associated with modifications to the design due to submittal of equipment and/or materials other than those used as the basis of design are the Contractor's responsibility. This includes any design time, production of drawings, and time delays.

D. Where use of equipment and/or materials other than those used as the basis of design impact other disciplines, Contractor shall assume responsibility for all costs associated with any APPROVED modifications. This may include resizing of electrical circuits, modifying openings in the structure, relocating floor drains, etc.

1.11 OPERATIONS AND MAINTENANCE MANUALS & TRAINING

A. Submit Operations and Maintenance Manuals two weeks prior to Substantial Completion Inspection. Engineer will not conduct a Substantial Completion Inspection without having reviewed Operations and Maintenance Manuals.

B. Use Operations and Maintenance Manuals as a guide for conducting training of Owner's personnel.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 230010

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Flexible, ball-joint packed expansion joints.
2. Rubber union connector packless expansion joints.
3. Flexible-hose packless expansion joints.
4. Metal-bellows packless expansion joints.
5. Rubber packless expansion joints.
6. Grooved-joint expansion joints.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flex-Hose Co., Inc.
   b. Mason Industries, Inc.
   c. Metraflex Company (The).

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with threaded end connections.
   a. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.

6. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F and 515 psig at 600 deg F ratings.

7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F and 200 psig at 600 deg F ratings.

8. Expansion Joints for Steel Piping NPS 8 to NPS 12: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

B. Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flex-Hose Co., Inc.
   b. Hyspan Precision Products, Inc.
   c. Mason Industries, Inc.
   d. Metraflex Company (The).

2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

3. Type: Circular, corrugated bellows with external tie rods.
4. Minimum Pressure Rating: 150 psig, unless otherwise indicated.
5. Expansion Joints for Copper Tubing: multi- ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

   a. End Connections for Copper Tubing NPS 2 and Smaller: threaded.
   b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: threaded.
   c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

6. Expansion Joints for Steel Piping: multi- ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

   a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
   b. End Connections for Steel Pipe NPS 2-1/2 and Larger: Welded.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-PSJ-703.

D. Install grooved-joint expansion joints to grooved-end steel piping.

END OF SECTION 230516

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
   2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
   1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
   3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
   4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade: Cast-iron wall sleeves.
   2. Exterior Concrete Walls below Grade: Cast-iron wall sleeves with sleeve-seal system. Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   3. Concrete Slabs-on-Grade: Cast-iron wall sleeves with sleeve-seal system. Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   4. Concrete Slabs above Grade: Galvanized-steel-pipe sleeves.
   5. Interior Partitions: Galvanized-steel-pipe sleeves.

END OF SECTION 230517

SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Insulated Piping: One-piece, stamped-steel type.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
   d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
   f. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.

2. Escutcheons for Existing Piping:
   a. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
   b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
   d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
   e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
   f. Bare Piping in Unfinished Service Spaces: Split-casting brass type with rough-brass finish.
   g. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. New Piping: One-piece, floor-plate type.
   2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 230518

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Liquid-in-glass thermometers.
   2. Thermowells.
   3. Dial-type pressure gages.
   4. Gage attachments.
   5. Test plugs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Trerice, H. O. Co.
      b. Weiss Instruments, Inc.
      c. Weksler Glass Thermometer Corp.

2. Standard: ASME B40.200.

3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.
    b. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: brass.
4. Material for Use with Steel Piping: stainless steel.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. Bore: Diameter required to match thermometer bulb or stem.
7. Insertion Length: Length required to match thermometer bulb or stem.
8. Lagging Extension: Include on thermowells for insulated piping and tubing.
9. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

C. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Trerice, H. O. Co.

b. Weiss Instruments, Inc.
c. Weksler Glass Thermometer Corp.

2. Standard: ASME B40.100.

3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of stainless-steel pipe with NPS 1/4 or NPS 1/2 pipe threads.

C. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Glass Thermometer Corp.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing two thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.8 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dwyer Instruments, Inc.
2. Emerson Process Management; Rosemount Division.
3. KOBOLD Instruments, Inc. - USA.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells with extension on insulated piping.

C. Fill thermowells with heat-transfer medium.

D. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

E. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids (except steam).

H. Install test plugs in piping tees.

I. Install flow indicators in piping systems in accessible positions for easy viewing.

J. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Two inlets and two outlets of each chiller.
4. Inlet and outlet of each hydronic coil in air-handling units.
5. Two inlets and two outlets of each hydronic heat exchanger.
6. Inlet and outlet of each thermal-storage tank.
7. Outside-, return-, supply-, and mixed-air ducts.

K. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

C. Thermometer stems shall be of length to match thermowell insertion length.

3.4 SCALE-RANGE SCHEDULE

A. Thermometer Scale Range for Chilled-Water Piping: 0 to 100 deg F.

B. Thermometer Scale Range for Condenser-Water Piping: 0 to 100 deg F.

C. Thermometer Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.

D. Thermometer Scale Range for Air Ducts: Minus 40 to plus 110 deg F.

E. Pressure Gauge Scale Range for Chilled-Water Piping: 0 to 60 PSI.

END OF SECTION 230519

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze angle valves.
2. Brass ball valves.
3. Bronze ball valves.
4. Iron ball valves.
5. Iron, single-flange butterfly valves.
6. Iron, grooved-end butterfly valves.
7. High-performance butterfly valves.
8. Bronze lift check valves.
9. Bronze swing check valves.
10. Iron swing check valves.
11. Iron swing check valves with closure control.
12. Iron, grooved-end swing-check valves.
13. Iron, center-guided check valves.
14. Iron, plate-type check valves.
15. Bronze gate valves.
16. Iron gate valves.
17. Bronze globe valves.
18. Iron globe valves.
19. Chainwheels.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
2. Gear Drive: For quarter-turn valves NPS 8 and larger.
3. Handwheel: For valves other than quarter-turn types.
4. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. Copper-Alloy Ball Valves:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. NIBCO INC.
   d. Watts Industries, Inc.; Water Products Div.
   e. Kitz Corporation

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

D. Copper-Alloy Ball Valves: Two-piece bronze body with exhaust vent opening, chrome-plated ball with vent, blowout-proof stem, locking handle, and working pressure rating 600-psigCWP.

2.4 PLUG VALVES

A. Plug Valves: MSS SP-78, 175-psi CWP, ASTM A 126 cast-iron body and bonnet, cast-iron plug, Buna N, Viton, or teflon packing, flanged or grooved end connections:

1. Operator: Lever.

2.5 FERROUS-ALLOY BALL VALVES

A. Manufacturers:
1. Crane Co.; Crane Valve Group; Stockham Div.
2. NIBCO INC.
3. Kitz Corporation

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 150, full port.

2.6 FERROUS-ALLOY BUTTERFLY VALVES

A. Manufacturers:

1. Ferrous-Alloy Butterfly Valves:
   a. Keystone
   b. Kitz Corporation
   c. Nibco

B. Butterfly Valves: MSS SP-67, 200-psi CWP, for tight shutoff, 150-psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, fully flanged style:

1. Disc Type: Elastomer-coated ductile iron.
2. Gear Drive: For quarter-turn valves NPS 8 and larger.
3. Operator for Sizes 2 Inchesto 6 Inches: Standard lever handle with memory stop.

2.7 BRONZE CHECK VALVES

A. Manufacturers:

1. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Red-White Valve Corp.

f. Watts Industries, Inc.; Water Products Div.
g. Kitz Corporation

B. Bronze Check Valves, General: MSS SP-80.

C. Type 4, Class 125, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.8 FERROUS-ALLOY WAFER CHECK VALVES

A. Manufacturers:

1. Dual-Plate, Ferrous-Alloy, Wafer Check Valves:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. NIBCO INC.
   d. Red-White Valve Corp.
   e. Watts Industries, Inc.; Water Products Div.
   f. Kitz Corporation

B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

C. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.

2.9 CAST-IRON GLOBE VALVES

A. Manufacturers:

1. Type I, Cast-Iron Globe Valves with Metal Seats:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. NIBCO INC.
   d. Red-White Valve Corp.
   e. Kitz Corporation

B. Cast-Iron Globe Valves, General: MSS SP-85.

C. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

2.10 BRONZE GATE VALVES

A. Manufacturers:

1. Bronze, Gate Valves:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. NIBCO INC.
   d. Powell, Wm. Co.
   e. Red-White Valve Corp.

f. Watts Industries, Inc.; Water Products Div.
g. Kitz Corporation

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

2.11 BRONZE GLOBE VALVES

A. Manufacturers:

1. Type 2, Bronze Globe Valves with Nonmetallic Disc:
   a. Crane Co.; Crane Valve Group; Stockham Div.
   b. Grinnell Corporation.
   c. NIBCO INC.
   d. Red-White Valve Corp.
   e. Kitz Corporation

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 2, Class 125, Bronze Globe Valves: Bronze body with PTFE or TFE disc and union-ring bonnet.

2.12 CHAINWHEELS

A. Manufacturers:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron of type and size required for valve. Include zinc coating.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for valves NPS 4and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly or plug valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Globe, angle or ball valves.
4. Pump-Discharge Check Valves: Spring-loaded, lift-disc check valves

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
5. For Steel Piping, NPS 5 and Larger: Flanged ends.
6. For Grooved-End Steel Piping: Valve ends may be grooved.

3.4 CHILLED-WATER AND HEATING-WATER VALVE SCHEDULE

A. Chilled-Water Systems: Use the following valve types:

1. Gate Valves: Class 150, bronze body; or Class 125, cast-iron body.
2. Ball Valves: Class 150, 600-psi CWP, with stem extension and memory stop.
3. Plug Valves: Buna N packing.
4. Globe Valves: Class 125, bronze body with bronze or teflon disc; or Class 125, cast-iron body.
5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM sleeve and stem seals.
6. Check Valves: Dual-plate, wafer, Class 150 ferrous alloy.

3.5 JOINT CONSTRUCTION

A. Refer to Division 23 Sections for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.6 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
4. Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. Flex-Strut Inc.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut Corporation; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   3. Standard: MFMA-4.
   4. Channels: Continuous slotted steel channel with inturned lips.
   5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   7. Metallic Coating: Hot-dipped galvanized.
   8. Paint Coating: Epoxy.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers:
   1. Carpenter & Paterson, Inc.
   2. ERICO/Michigan Hanger Co.
   3. PHS Industries, Inc.
   4. Pipe Shields, Inc.
   5. Rilco Manufacturing Company, Inc.
   6. Value Engineered Products, Inc.

B. Insulation-Insert Material for Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Plastic.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
3. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
4. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
5. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
6. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
7. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548.13 - VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Housed-restrained-spring isolators.
5. Elastomeric hangers.
6. Spring hangers.
7. Vibration isolation equipment bases.

B. Related Requirements:

1. Section 210548.13 "Vibration Controls for Fire Suppression" for devices for fire-suppression equipment and systems.
2. Section 220548.13 "Vibration Controls for Plumbing" for devices for plumbing equipment and systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

D. Wind-Restraint Details:

1. Basic Wind Speed: Refer to Arch.
2. Building Classification Category: Refer to Arch.
3. Code recommended wind pressure multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
4. Design Analysis: To support selection and arrangement of **wind** restraints. Include calculations of combined tensile and shear loads.
5.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For testing agency.

C. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Provide operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.

8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Elastomeric Isolation Pads:
1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Ribbed or Waffle pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Resilient and elastomeric.

a. Surface Pattern: Ribbed or Waffle pattern.
b. Infused nonwoven cotton or synthetic fibers.

C. Double-Deflection, Elastomeric Isolation Mounts:
1. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

D. Restrained Elastomeric Isolation Mounts
1. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

E. Freestanding, Laterally Stable, Open-Spring Isolators:
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:
1. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes elastomeric pad.
c. Internal leveling bolt that acts as blocking during installation.

2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

H. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

I. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

J. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

3.3 VIBRATION ISOLATION EQUIPMENT BASES INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03 Sections.

3.4 VIBRATION-CONTROL AND WIND-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

END OF SECTION 230548.13

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

2. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.5 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Division 09 Sections.

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule: Coordinate with Owner.

3.5 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes: Coordinate with Owner.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.7 PAINTING

A. Clarification: In exposed areas (with no acoustic ceiling tiles), piping and piping insulation shall be painted. Although Division 9 may not specifically call for painting of MEP items, it states paint type and requirements for different materials. To extent possible coordinate painting with Division 9 and with Architect. Where adequate specifications are not available, use the following general guidelines:
   1. Ferrous Metal: Semi-Gloss, Alkyd-Enamel Finish: 2 finish coats over an enamel undercoat and primer.
      a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils. S-W: Kem Kromik Universal Metal Primer B50NZ6/B50WZ1.
      b. Undercoat: Alkyd, interior enamel undercoat or semi-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils. S-W: Pro-mar 200 Interior Alkyd Enamel B34W200 Series.
      c. Finish Coat: Same as undercoat. Semi-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
   2. ASJ Jacket: Semi-Gloss, Acylic-Enamel Finish: 2 finish coats.
      a. Undercoat: Semi-gloss acrylic latex enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.0 mils. S-W: Pro-Mar Interior Latex Egg-Shell Enamel B20W200.

b. Finish Coat: Same as undercoat. Semi-gloss, acrylic latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils

B. Final colors shall be coordinated with Owner and Architect during construction.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. TAB work shall not be contracted under Division 23 Contractor. Third party TAB Contractor shall be contracted by the Prime Contractor. Coordinate activities and assist TAB Contractor as needed.

B. Background and Scope of Work: See detailed Summary of Work for Base and Alternate Bids.
1. Base Bid: Installation of Owner pre-purchased equipment such as DX split systems, DX RTUs, VAV hydronic AHUs, VFDs, and related controls upgrades.
2. Alternate Bid: Replacement of air distribution system including motorized zone dampers and related controls. Existing AHU will be retained and reused.
3. Common scope for Base and Alternate Bids:
   a. TAB and controls verification of all new equipment and systems.
   b. Verification of motorized OA and RA dampers operation, and balancing of flow rates at units at different fan speeds. Applies to all equipment.
   c. Controls for all existing and replaced equipment and systems shown on drawings.
   d. Duct leakage testing for replaced air distribution systems.

C. Section Includes:
1. Balancing Air Systems:
   a. Constant-volume air systems.
   b. Variable-air-volume systems.

2. Testing, Adjusting, and Balancing Equipment:
   a. Motors.
   b. Heat-transfer coils.
   c. Hydronic AHUs and FCUs.
   d. VAV boxes and zone dampers
   e. DX Split Systems.
   f. DX RTUs

3. Testing, adjusting, and balancing existing systems and equipment.
4. Duct leakage tests.
5. Control system verification.
6. Other tests as specified.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

1.4 PREINSTALLATION MEETING

A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:
   a. The Contract Documents examination report.
   b. The TAB plan.
   c. Needs for coordination and cooperation of trades and subcontractors.
   d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports.

1. Standard report forms from AABC, NEBB, or TABB are acceptable.
2. Report forms from other than AABC, NEBB, or TABB may be acceptable even if organized differently, but must contain the same essential information.

C. Sample report forms.

D. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 PROJECT CONDITIONS

A. The Owner will occupy portions of existing buildings Owner will occupy the site and existing building during entire TAB period. Reference SECTION 011000 - SUMMARY for more precise dates and stipulations.

B. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment

performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. At least 15 calendar days prior to any on-site TAB measurements taking place, prepare and submit to Engineer a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.

d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
b. Piping is complete with terminals installed.
c. Water treatment is complete.
d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning per the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.

c. **Measure static pressure across heat transfer coils and other system components as detailed in paragraphs for HEAT-TRANSFER COILS to follow.**
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

E. To obtain scheduled outside air (OA) flow rates: Balance OA and RA dampers at the unit to get scheduled OA Flow CFM at fan speeds (low and high). Coordinate OA and RA dampers with BAS Controls Contractor.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
    g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
    b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:

    a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
    b. Re-measure and confirm that total airflow is within design.
    c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
    d. Mark final settings.
    e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
    f. Verify tracking between supply and return fans.

B. To obtain scheduled outside air (OA) flow rates for AHUs with Variable Frequency Drives: Balance OA and RA dampers at the AHUs to get scheduled OA Flow CFM at fan speeds of 100%, 50%, and 30%. Coordinate OA and RA dampers with BAS Controls Contractor.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.8 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first.

B. Balance the secondary circuits after the primary circuits are complete.

C. Adjust pumps to deliver total design gpm.

1. Measure total water flow.

a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
c. Convert pressure to head and correct for differences in gage heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

D. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

E. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

F. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

G. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

H. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

I. Verify that memory stops have been set.

J. Test flow meters provided by BAS, and verify flow meter accuracy at expected max flow rate, expected min flow rate, and midway between. Include findings in final report.

3.9 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.
1. Verify VFD controller is keeping correct time/date and maintains it after restoration of power outage.
2. Reduction in VFD speed from 60hz is to be the initial means of balancing systems. It is not acceptable to operate VFD at 60hz (or higher) and then balance system by throttling valves or dampers. Throttle flow(s) to outlet devices (e.g. coils, air devices, etc.) only after VFD has been reduced to lowest speed required to provide design flow.
    a. Set the maximum required VFD speed at VFD controller, and report speed in final TAB report.
3. Test manual bypass of controller to prove proper operation.

3.10 PROCEDURES FOR CONDENSING UNITS

A. Record the following data:
1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Phase and hertz.
4. Nameplate and measured voltage, each phase.
5. Nameplate and measured amperage, each phase.

B. Verify proper rotation of fans.

3.11 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data **for each DX, cooling and heating coils**:
   1. Dry-bulb temperature of entering and leaving air.
   2. Wet-bulb temperature of entering and leaving air.
   3. Airflow.
   4. Air pressure drop.
      a. Units 6 tons and less: Overall readings (upstream of filters, fan suction, fan discharge) are to be taken for all units. A full test of air pressure drops across every single component of the system (i.e. filters, coils) need be taken only for a representative sample of units as follows:

Qty of units Installed	Full Testing
1-10	1
10-20	2
20-30	3
31+	4

      b. Units larger than 6 tons: Readings across **all system components** are to be taken for all units larger than 6 tons.

B. Where a unit has multiple coils (e.g. main cooling coil and a reheat coil), take and record data for each coil under conditions as close as possible to intended design operation (e.g., with cooling coil producing control-system sub-cooling setpoint, reheat coil producing control-system supply temperature setpoint).

C. Measure, adjust, and record the following data for each electric heating coil:
   1. Nameplate data.
   2. Airflow.
   3. Entering- and leaving-air temperature at full load.
   4. Voltage and amperage input of each phase at full load.
   5. Calculated kilowatt at full load.
   6. Fuse or circuit-breaker rating for overload protection.

D. Measure, adjust, and record the following data for each water coil:
   1. Entering- and leaving-water temperature.
   2. Water flow rate.
   3. Water pressure drop.
   4. Dry-bulb temperature of entering and leaving air.
   5. Wet-bulb temperature of entering and leaving air for cooling coils.
   6. Airflow.
   7. Air pressure drop.

3.12 DUCT LEAKAGE TESTS

A. Duct leakage testing will be performed by mechanical installation contractor.

B. Witness the duct pressure testing and provide written report on results immediately thereafter.
   1. Verify that proper test methods are used and that leakage rates are within specified tolerances.

2. Report results of all testing and any deficiencies observed. Provide floor plans in report indicating sections of duct tested, and test criterion.

3.13 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

D. Data may be trended using Building Automation System. However, calibration of DDC sensors must be verified prior to trending data.

3.14 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS

A. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

B. Measure, adjust, and record the pressurization of each room, each zone, and each building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.

C. Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.
   1. For pressure measurements, measure and record the pressure difference between the intended spaces at the door with all doors in the space closed. Record the high-pressure side, low-pressure side, and pressure difference between each adjacent space.
   2. For applications with cascading levels of space pressurization, begin in the most critical space and work to the least critical space.
   3. Test room pressurization first, then zones, and finish with building pressurization.

D. To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.

E. For spaces with pressurization being monitored and controlled automatically, observe and adjust the controls to achieve the desired set point.
   1. Compare the values of the measurements taken to the measured values of the control system instruments and report findings.
   2. Check the repeatability of the controls by successive tests designed to temporarily alter the ability to achieve space pressurization. Test over-pressurization and under-pressurization and observe and report on the system's ability to revert to the set point.

3. For spaces served by variable-air-volume supply and exhaust systems, measure space pressurization at indicated airflow and minimum airflow conditions.

F. In spaces that employ multiple modes of operation, such as normal mode and emergency mode or occupied mode and unoccupied mode, measure, adjust, and record data for each operating mode.

G. Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

3.15 PROCEDURES FOR INDOOR-AIR QUALITY MEASUREMENTS

A. After air balancing is complete and with HVAC systems operating at indicated conditions, perform indoor-air quality testing.

B. Observe and record the following conditions for each HVAC system:
1. The distance between the outside-air intake and the closest exhaust fan discharge, flue termination, or vent termination.
2. Specified filters are installed. Check for leakage around filters.
3. Cooling coil drain pans have a positive slope to drain.
4. Cooling coil condensate drain trap maintains an air seal.
5. Evidence of water damage.
6. Insulation in contact with the supply, return, and outside air is dry and clean.

3.16 CONTROLS VERIFICATION

A. Measure accuracy of all sensors (temperature, humidity, dewpoint, pressure, carbon dioxide (CO2), etc.) associated with air conditioning systems and the Building Automation System (BAS).

B. At direction of Engineer, BAS and/or HVAC systems providers will be required to replace or calibrate sensors based upon this TAB sensors accuracy report. Subsequent to such replacement and calibration, re-measure accuracy of those sensors which were calibrated or replaced and submit report per directions above.

C. In conjunction with system balancing, perform the following:
1. Temperature, pressure, CO2, relative humidity (RH) sensors.
   a. Obtain submittal information regarding manufacturer's claimed sensor accuracy.
   b. Verify that all sensors are reading within accuracy limits of manufacturer's claimed sensor accuracy, or accuracy required in specifications, whichever is the more stringent. This includes sensors supplied by controls company, those installed in spaces, in ductwork, in piping, and those which come integral to HVAC equipment manufacturer or supplied by HVAC equipment manufacturer. Use measuring instrument, calibrated within past year, of higher accuracy than sensor being tested.
      1) Accuracy of temperature and RH sensors may be verified at one single reading, i.e. the temperature or RH of the room or substance at the time the sensor is being checked.

2) Verify accuracy of pressure sensors at no flow condition (i.e. unit off), and when unit is operating.
3) Verify two-point accuracy of CO2 sensors: 1, at Low end, where room has been unoccupied for a long period of time; CO2 should be near 400ppm; and 2, at High end, a time when room is or has been occupied such that CO2 has risen to 700ppm or more. (This second measurement may need to take place after building is occupied, i.e. during the 90 day follow up visit. For rooms which are 'permanently' unoccupied, High end reading need not be taken.)

c. Verify sensors are installed and in locations appropriately for intended use; list observations regarding sensors installation which may impact satisfactory operation of HVAC systems. (For examples: verify that room temperature sensors are installed in a location appropriate for space (e.g., not on exterior wall, not exposed to sun, not above heat generating equipment, etc.); verify readings of unit return air sensors are not impacted by outside air intake.)

2. Verify the following:
   a. Operation of valves, dampers, and associated actuators.
   b. Temperature control system is operating within the design limitations.
   c. Operation of lockout or interlock systems.
   d. Damper leakage is in accordance with submitted performance and does not prevent system operation in accordance with design intent.
   e. Leakage through valves is no greater than submitted leakage rate.

3. Verify that controlled devices are properly installed and connected to correct controller.
4. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
5. Confirm that the sequences of operation are in compliance with Contract Documents.

3.17 REPORT ON SENSOR ACCURACY

A. Prepare a stand-alone report on sensor accuracy findings, as detailed in 'CONTROLS VERIFICATION'. Submit to General Contractor, Mechanical Contractor, Architect, Engineer, and Commissioning Agent (**CxA**).
   1. Report must be delivered promptly after sensor testing is complete in order that BAS contractor and/or equipment suppliers may replace faulty sensors before commissioning functional testing begins.

B. List every sensor tested, and indicate which room or equipment item it is associated with. Provide observations regarding sensors installation which may impact satisfactory operation of HVAC systems, such as improper location of sensors. List:
   1. Specified or submitted sensor accuracy, whichever is more stringent.
   2. Initial sensor reading re BAS or equipment controller.
   3. Sensor reading re TAB company's calibrated instrument.
   4. Required Offset, if sensor is within specified/submitted accuracy.
      a. Any sensors which require an "offset" by controller which is greater than required accuracy will be replaced by supplier.

C. TAB may create table formatting to display required data. A sample proposed format provided below for several types of sensors.

Required Sensor Accuracy
Space temperature sensors: ±0.75deg F
Space RH sensors: ±2%
Space CO2 sensors: ±30 PPM + 3% of reading
etc….

CO2 Sensor Low-Side Readings

Location	Sensor Reading	TAB Reading	Required Offset	Comment
RTU-310 space	340ppm	407ppm	-	REPLACE
RTU-311 space	388ppm	410ppm	+22ppm	
RTU-Café E ret air	290ppm	425ppm	-	REPLACE

Space Temperature Sensor Readings

Location	Sensor Reading	TAB Reading	Required Offset	Comment
Rm 123	73.4F	73.6F	0F	
Rm 124	73.0F	74.3F	1.3F	

Return Air Temperature Sensor Readings

Location	Sensor Reading	TAB Reading	Required Offset	Comment
RTU-310	69.5F	74.5F	-	REPLACE
RTU-311	70.5F	71.5F	+1.0F	

3.18 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

ISO certification for sensors
Greystone Standard Accuracy…….CDD5A & B: ±30 PPM + 3% of reading with Auto Cal on

3.19 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS - I suggest removing this whole section.

A. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

B. Measure, adjust, and record the pressurization of each room, each zone, and each building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.

C. Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.

1. For pressure measurements, measure and record the pressure difference between the intended spaces at the door with all doors in the space closed. Record the high-pressure side, low-pressure side, and pressure difference between each adjacent space.
2. For applications with cascading levels of space pressurization, begin in the most critical space and work to the least critical space.
3. Test room pressurization first, then zones, and finish with building pressurization.

D. To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.

E. For spaces with pressurization being monitored and controlled automatically, observe and adjust the controls to achieve the desired set point.

1. Compare the values of the measurements taken to the measured values of the control system instruments and report findings.
2. Check the repeatability of the controls by successive tests designed to temporarily alter the ability to achieve space pressurization. Test over-pressurization and under-pressurization, and observe and report on the system's ability to revert to the set point.
3. For spaces served by variable-air-volume supply and exhaust systems, measure space pressurization at indicated airflow and minimum airflow conditions.

F. In spaces that employ multiple modes of operation, such as normal mode and emergency mode or occupied mode and unoccupied mode, measure, adjust, and record data for each operating mode.

G. Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

3.20 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

C. **Provide copy of reports to Contractor, Engineer, and Commissioning Agent.**

3.21 FINAL REPORT

A. Format

1. **Report must be submitted in digital electronic format, in a fully searchable .pdf file.** Reports which are non-searchable or which contain scans of paper copies will be returned un-reviewed.
2. Bookmark report to indicate major sections and individual HVAC units.

B. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
   a. Date the report is submitted must be on cover page.
   b. Project name.
   c. Project location.
   d. Name and address of General Contractor, Mechanical Contractor (if TAB is subcontractor to Mechanical), and TAB Contractor.
   e. Name and contact information for TAB Contractor's representative.
   f. Architect's and Engineer's name and address.

2. Table of Contents.

3. Certifications.
   a. Certificate of TAB certifying agency.
   b. Work Guaranty.
   c. Signature of TAB supervisor who certifies the report.
4. Instrument Calibration Reports:
   a. Instrument type and make.
   b. Dates of use.
   c. Dates of calibration.
5. List of abbreviations used in report.
6. Nomenclature and data sheets for each item of equipment, including manufacturer's name, type, size. Include, at minimum:
   a. Fan curves.
   b. Pump curves.
   c. Manufacturers' test data.
   d. Field test reports prepared by system and equipment installers.
   e. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. Final Report Contents: In addition to items listed above, include:
1. Original test report of sensor accuracy testing.
2. Duct leakage test report.
3. Summary of observations on proper drainage of condensate drain pans for every item of equipment having a condensate drainage system.
   a. Proper pan slope and pan condensate evacuation.
   b. Adequate condensate trap depth versus static requirement.
   c. Adequate slope and lack of 'bellies' in condensate pipe drainage system.
   d. Proper pumped condensate operation.

4. Field observations list of conditions of filters (verify construction filters are removed and final filters are clean) and filter racks.
5. Field measurements and observations regarding leakage of outdoor air and control air dampers.
6. Certified field-report data for each balanced system, including specified versus final performance, notable characteristics of systems, description of system operation sequence if it varies from the Contract Documents
7. Layouts of air distribution systems from construction as-built drawings.
    a. Number all air devices and systems referenced in report body.
    b. Scans of paper drawings are not acceptable. Hand-written notes for numbering devices, duct runs, etc., are permissible, but the basic floor plans and duct / piping layouts, equipment and devices locations, etc., must be from original pdf files.
    c. Indicate duct, outlet, and inlet sizes, pipe and valve sizes and locations, locations of major equipment items such as air handlers, fans, air terminal units, pumps, etc., balancing stations.

8. Summary of Deficiencies:
    a. Report must include a comprehensive summary page listing all equipment / systems which were not balanced to within specified range.
    b. For each instance where system or individual component of a system is not balanced to within specified range, provide a clear explanation of why it cannot be so balanced, and propose remedial steps.
    c. Disclaimers, miscellaneous informational factoids, explanatory text concerning methodology, and other information not specifically relevant to actual deficiencies may be included towards the end of report, but are not to be included on the Summary Of Deficiencies page.

9. Summary Of Critical Measurements and Setpoints:
    a. Provide a table which summarizes critical measurements and settings for all HVAC equipment 1HP and larger. Sample tables provided below for pumps and air-side systems showing minimum required information:

Unit Name	Design CFM	Measured CFM	Design ESP	Measured ESP	Tap or VFD Speed Setting	Req'd Static Stpt
RTU-123	1,000	990	1.50"	1.10"	55%	NA

    * Individual system/unit.
    a. Nameplate, design, and measured performance as described in this specification.
        1) The intent of TAB measurements is to prove unit performs in accordance with manufacturer's specified and submitted data. Change setpoints as required to achieve this result. (For example in a dedicated outside air unit with hot gas reheat, set the cooling coil leaving air temperature setpoint and the unit leaving air temperature setpoint to achieve cooling coil design.) Clearly indicate in report the setpoints in effect when measurements were taken.
    b. Include fan and pump curves for units 1.5HP and larger.
    c. For units with VFD speed control: Indicate required VFD speed and whether VFD was speed-limited in its controller settings.

11. Floor plans (as-built) showing HVAC unit locations, duct layouts, air terminal devices numbered to match measured data points.

a. Show location of air-side pressure sensors, differential or straight pressure, where such sensors are used in control

13. Checklist of DX HVAC unit inspections: **Sample checklists below.** Include comments as required to explain anomalies or deficiencies. (Engineer will provide sample file in Excel format upon request.)

Unit Inspection Checklist

DX Units	**RTU-1**	**RTU-2**	**RTU-2**
Condensate drain pan is clean			
Condensate pan fully draining, no ponding in pan			
No excessive damper air leakage			
No air leakage @ cabinet, doors, duct connections			
Final air filters installed and clean			
Final filters of type/MERV rating specified			
Coil fins undamaged and/or combed straight			
Fan free of vibration, rotating in correct direction			
Unit interior cleaned and vacuumed			
Access doors open fully & freely			

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. RTU/Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:
a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.

i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Filter static-pressure differential in inches wg.
   f. Cooling-coil static-pressure differential in inches wg.
      1) Dry-bulb temperature of entering and leaving air.
      2) Wet-bulb temperature of entering and leaving air for cooling coils.
      3) Air flow
      4) Air pressure drop
      5) Entering- and leaving-water temperature (for hydronic AHUs)
      6) Water flow rate (for hydronic AHUs)
      7) Water pressure drop (for hydronic AHUs)
   g. Heating-coil static-pressure differential in inches wg.
   h. Outdoor airflow in cfm.
   i. Return airflow in cfm.
   j. Outdoor-air damper position.
   k. Return-air damper position.
   l. Vortex damper position.
   m. Settings for outdoor-, return-air dampers.

      1) Air handling units *may* be designed to operate with fan varying from high to low speed.
      2) For such units, TAB must measure required outside air damper (& return, where applicable) position for intake of design ventilation air not only at full fan speed, but at low fan speed as well. Report results in final TAB report.
      3) Minimum damper position shall be determined by TAB Contractor such that building remains positively pressurized when building exhaust fans are on. Report results in final TAB report.
      4) Convey required damper positions to BAS contractor as soon as they are known, prior to submission of final TAB report.

F. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:
   1. Unit Data:
      a. Unit identification.
      b. Location.
      c. Unit make and model number.

d. Compressor make.
e. Compressor model and serial numbers.
f. Refrigerant weight in lb.
g. Low ambient temperature cutoff in deg F.

2. Test Data (Indicated and Actual Values):
a. Inlet-duct static pressure in inches wg.
b. Outlet-duct static pressure in inches wg.
c. Entering-air, dry-bulb temperature in deg F.
d. Leaving-air, dry-bulb temperature in deg F.
e. Control settings.
f. Unloader set points.
g. Low-pressure-cutout set point in psig.
h. High-pressure-cutout set point in psig.
i. Suction pressure in psig.
j. Suction temperature in deg F.
k. Condenser refrigerant pressure in psig.
l. Condenser refrigerant temperature in deg F.
m. Oil pressure in psig.
n. Oil temperature in deg F.
o. Voltage at each connection.
p. Amperage for each phase.
q. Kilowatt input.
r. Crankcase heater kilowatt.
s. Number of fans.
t. Condenser fan rpm.
u. Condenser fan airflow rate in cfm.
v. Condenser fan motor make, frame size, rpm, and horsepower.
w. Condenser fan motor voltage at each connection.
x. Condenser fan motor amperage for each phase.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:
a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F.
    d. Duct static pressure in inches wg.
    e. Duct size in inches.
    f. Duct area in sq. ft..
    g. Indicated airflow rate in cfm.
    h. Indicated velocity in fpm.
    i. Actual airflow rate in cfm.
    j. Actual average velocity in fpm.
    k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Make, type and model number, size.
    c. Number from system diagram.
    d. Final k-factor.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm.
    b. Air velocity in fpm.
    c. Preliminary airflow rate as needed in cfm.
    d. Preliminary velocity as needed in fpm.
    e. Final airflow rate in cfm.
    f. Final velocity in fpm.
    g. Space temperature in deg F.

J. VFD-served equipment:
1. A pump or fan served by a VFD must be balanced for maximum energy efficiency by limiting maximum speed via the VFD (“Maximum Allowed Speed”). It is not acceptable to operate VFD at 60hz (or higher) and then balance system by throttling valves or dampers.
2. VFD Maximum Allowed Speed is to be determined such that design flow is met in the most critical (highest pressure drop) flow path with no throttling in that path. Other flow paths may then be balanced by throttling as needed with VFD at Maximum Allowed Speed.

3. VFD Maximum Allowed Speed shall be programmed at the VFD controller or AHU/RTU.

K. Flowmeters: Verify flow meter accuracy at expected maximum flow rate, expected minimum flow rate, and midway between. Include findings in final report.

L. Indoor-Air Quality Measurement Reports for Each HVAC System:
1. HVAC system designation.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Room number or similar description for each location.
5. Measurements at each location.
6. Observed deficiencies.

M. Instrument Calibration Reports:
1. Report Data:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.22 ADDITIONAL TESTS

A. Within 90 days of completing TAB, re-visit site to perform additional TAB measurements to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
1. Consult with Engineer prior to site visit to develop a measurement plan, and determine which systems, units, or locations need particular attention.
2. Submit report of findings and modifications made.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

3.23 SUMMARY OF SYSTEMS SCOPE WORK FOR TESTING AND BALANCING

A. The following systems are to be included in scope of TAB work for this project:
1. Air distribution systems (ducts, dampers, outlets, etc.)
2. Hydronic AHUs and FCUs
3. Packaged RTUs, Split System DX units, including AHUs to remain.
4. New VAV boxes, and zone dampers
5. Controls

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.

B. Related Sections:
1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, and are limited to, the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed
      b. Manson.
      c. Knauf FiberGlass GmbH.
      d. Owens-Corning Fiberglas Corp.
      e. Schuller International, Inc.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.9 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 4 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.

6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
   a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Service: Round & rectangular, supply-air ducts concealed.
1. Material: Mineral-fiber blanket.
2. Thickness: 3 inches (R-8 min).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Round & rectangular, return, outside-air and fume hood exhaust ducts concealed.
1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (R-6 min).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

C. Service: Round supply, make-up, and outside-air ducts, exposed in conditioned space.

1. Double wall, with 2” insulation thickness, and painted.

D. Service: Return air duct, exposed in conditioned space: No insulation. Paint duct.

E. Service: Ten feet of supply and return air ducts closest to AHU or FCU.
   1. Material: In addition to exterior wrap, provide internal liner for sound attenuation purposes.
   2. Thickness: 1 inches.

F. Service: Ten feet of exhaust air duct closest to where duct penetrates the exterior envelope.
   1. Material: Exterior wrap.
   2. Thickness: 2 inches.

G. Where ductwork is not completely concealed, paint all ductwork and insulation. Coordinate color and finish with Architect.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Chilled-water and brine piping, indoors.
3. Refrigerant piping, indoors and outdoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cellular-Glass Insulation:
   a. Pittsburgh-Corning Corp.
   b. Cell-U-Foam Corporation; Ultra-CUF.

2. Flexible Elastomeric Thermal Insulation:
   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

3. Closed-Cell Phenolic-Foam Insulation:
   a. Kooltherm Insulation Products, Ltd.

2.2 INSULATION MATERIALS

A. Mineral-fiber insulation will NOT be allowed for use on any cold piping systems.

B. Mineral-fiber wrap is NOT approved for use on piping insulation.

C. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

D. Products shall not contain asbestos, lead, mercury, or mercury compounds.

E. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

F. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

G. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

H. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Block Insulation: ASTM C 552, Type I.
   2. Special-Shaped Insulation: ASTM C 552, Type III.
   3. Preformed Pipe Insulation with Factory-Applied: Comply with ASTM C 552, Type II, Class 2.
   4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

I. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

J. Phenolic:
   1. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
   2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
   3. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
   4. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.

      a. Preformed Pipe Insulation: ASJ.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products:

    a. Childers Products, Division of ITW; CP-96.
    b. Foster Products Corporation, H. B. Fuller Company; 81-33.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products:

    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products:

    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.

4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:
1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Factory cut and rolled to size.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier: 3-mil-thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.

6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range. **NO EXCEPTION: PIPES SHALL BE PAINTED.**

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.11 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of

inspection shall be limited to three locations of straight pipe, three locations of fittings, two locations of strainers, three locations of valves, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 3/4 inch thick.

2. Vapor Retarder Required: Yes.

B. Chilled Water and Brine, 60 Deg F and below:

1. NPS 3 and Smaller: Insulation shall be one of the following:

   a. Cellular Glass: 2 inches thick.
   b. Phenolic: 2 inches thick.

2. NPS 4 to NPS 12: Insulation shall be one of the following:

   a. Cellular Glass: 3 inches thick.
   b. Phenolic: 3 inches thick.

3. Vapor Retarder Required: Yes.

C. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be:
   a. Flexible Elastomeric: **1-inch** thick minimum, with two coats of protective coating recommended by the insulation manufacturer.

2. Vapor Retarder Required: Yes.

D. Where piping is exposed to view or not completely concealed above wall-to-wall suspended ceiling tiles, insulation shall be painted. Coordinate color and finish with Architect.

3.15 OUTDOOR PIPING INSULATION SCHEDULE (INCLUDES PUMP ROOM)

A. Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Flexible Elastomeric: 3/4 inch thick.

   2. Vapor Retarder Required: Yes.
   3. Field-Applied Jacket: Aluminum jacket.

B. Chilled Water and Brine, 60 Deg F and below:

   1. NPS 3 and Smaller: Insulation shall be one of the following:

      a. Cellular Glass: 2.5 inches thick.
      b. Phenolic: 2.5 inches thick.

   2. NPS 4 to NPS 12: Insulation shall be one of the following:

      a. Cellular Glass: 3 inches thick.
      b. Phenolic: 3 inches thick.

   3. Vapor Retarder Required: Yes.
   4. Field-Applied Jacket: Aluminum jacket.

A. Refrigerant Suction and Hot-Gas Piping:

   1. All Pipe Sizes: Insulation shall be:
      a. Flexible Elastomeric: **1 inch** thick minimum, with two coats of protective coating recommended by the insulation manufacturer.

   2. Vapor Retarder Required: Yes.
   3. Field-Applied Jacket: Aluminum jacket.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
   1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.020 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230719

SECTION 230800 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for the following MEP systems, assemblies, and equipment:
   1. Replacement HVAC equipment and controls.
   2. Controls and instrumentation, including BAS energy monitoring and control system.

B. Related Requirements:
   1. Section 019113 "General Commissioning Requirements" for general commissioning process requirements and Commissioning Coordinator responsibilities.

1.3 DEFINITIONS

A. Refer to Section 019113 "General Commissioning Requirements" for additional definitions and assignment of responsibilities.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Refer to Section 019113 "General Commissioning Requirements".

B. Perform commissioning tests at the direction of the CxA.

C. Attend construction phase controls coordination meeting.

D. Attend testing, adjusting, and balancing review and coordination meeting.

E. Participate in mechanical systems, assemblies, equipment, and component maintenance orientation and inspection.

F. Provide information requested by the CxA for final commissioning documentation.

G. 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 required test period.

H. Provide Project-specific construction checklists and commissioning process test procedures for actual mechanical systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

I. Direct and coordinate commissioning testing among subcontractors, suppliers, and vendors.

J. Verify testing, adjusting, and balancing of Work are complete.

K. Provide test data, inspection reports, and certificates in Systems Manual.

1.5 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:
   1. Plan for delivery and review of systems manuals, and other documents and reports.
   2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
   3. Process and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for mechanical systems, assemblies, equipment, and components to be verified and tested.
   4. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
   5. Certificate of readiness certifying that mechanical systems, subsystems, equipment, and associated controls are ready for testing.
   6. Test and inspection reports and certificates.
   7. Corrective action documents.
   8. Verification of testing, adjusting, and balancing reports.

1.6 INFORMATIONAL SUBMITTALS

A. Construction Checklists: See related Sections for technical requirements, and generate construction checklists for the following:
   1. Instrumentation and control for MEP systems.
   2. Rooftop Systems, Split Systems, VFDs

B. Certificates of readiness.

C. Certificates of completion of installation, pre-start, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Refer to Section 019113 "General Commissioning Requirements".

3.2 SYSTEMS READINESS CHECKLISTS

A. Construction Checklists: Assist CxA in the preparation of detailed Systems Readiness checklists for systems, subsystems, equipment, and components.
   1. Contributors to the development of checklists shall include, but are not limited to:
      a. Systems and equipment installers.

b. TAB technicians.
c. Instrumentation and controls installers.

B. Contractor shall conduct Systems Readiness Testing to document compliance with installation and Systems Readiness checklists prepared by Commissioning Authority for Division-23 items.

C. Refer to Section 019113 "General Commissioning Requirements" for issues relating to Systems Readiness checklists and testing, description of process, details on non-conformance issues relating to pre-functional checklists and test.

3.3 SYSTEM START-UP

A. Contractor is solely responsible for system start-up. CxA may, at his discretion, witness start up procedures, but will not perform any Functional Testing of systems until Contractor has completed start-up and resolved all operating deficiencies.

3.4 TESTING PREPARATION

A. Certify that systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents and approved Shop Drawings and submittals, and that pretest set points have been recorded.

C. Certify that TAB procedures have been completed and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

3.5 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Provide technicians, instrumentation, and tools to verify testing and balancing of mechanical systems at the direction of the CxA.
1. The CxA will notify Contractor 4 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes 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.
4. Remedy deficiency and notify CxA so verification of failed portions can be performed.

3.6 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of mechanical testing shall include entire HVAC installation, from equipment through distribution systems to each space served. 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. Tests will be performed using design conditions whenever possible.

E. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Contracting Officer and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

F. The CxA may direct that set points be altered when simulating conditions is not practical.

G. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

H. If tests cannot be completed because of a deficiency outside the scope of the mechanical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

I. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.7 GENERAL TESTING PROCEDURES FOR HVAC SYSTEMS, SUBSYSTEMS, AND EQUIPMENT

A. HVAC Instrumentation and Control System Testing: Contractor shall fully test operation of controls system prior to requesting Functional Testing with CxA. Point-to-point check out sheets and as-built control diagrams shall be provided to CxA so he may develop testing procedures.

B. HVAC Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air distribution systems; special exhaust; and other distribution systems, including HVAC terminal equipment and unitary equipment.

3.8 FUNCTIONAL TEST PROCEDURES FOR SYSTEMS TO BE COMMISSIONED

A. General

1. The following paragraphs outline the functional test procedures for the various Div. 23 items to be commissioned. Functional testing will take place only after System Readiness

checklists have been completed, equipment has been started-up, TAB has been verified, and Contractor has certified that systems are ready for functional testing.

2. All systems controlled via the Building Automation System shall have all control points and sequences tested by Controls Contractor prior to requesting testing by CX Authority.
3. Functional testing of HVAC systems shall include testing of the BAS.

B. All Equipment:
1. Verify nameplate information (serial numbers, model numbers, etc.); verify that equipment capacity is in accordance with requirements of construction documents.
2. Verify unit runs smoothly and quietly.
3. Verify operation of safeties.
4. Verify electrical wiring and grounding is correct.
5. Verify maintenance and NEC clearances are maintained.
6. Verify Systems Readiness Checklists have been completed.

3.9 COMMISSIONING TESTS

A. Functional testing will be performed on all HVAC equipment, including but limited to the following:
1. DX RTUs
2. DX Split Systems
3. Hydronic HVAC Systems
4. Air distribution system
5. Building automation system

B. Sample requirements are as follows:
1. Record temperatures, pressures.
2. Record programmed setpoints (unocc/occ T, RH, CO2, runtime, safeties, alarms).
3. Record programmed schedules and interlocks.
4. Verify equipment installation
5. Verify equipment operation.
6. Verify electrical voltage and amperages are within tolerance.
7. Verify unit data in TAB report.
8. Verify alarms and safeties.
9. Verify all sequences.
10. Verify setpoint resets, adaptive controls for energy conservation.

C. Customized system readiness checklists and function testing requirements will be released after the submittal review phase.

3.10 TRAINING AND O&M MANUALS

A. Refer to Div. 23 specifications.

END OF SECTION 230800

SECTION 230900 – INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hardware and control sequence requirements for replacement HVAC systems. Provide controls upgrades, and fully-integrate them with the existing DDC system.

B. Section Includes:
   1. Design Intent is to get new controls for replaced equipment, that is fully integrated with the equipment, and fully accessible via the web. Coordinate with equipment manufacturer, and integrate controls as needed to ensure that all safeties and warranties are retained. See Division of Scope for Base and Alternate Bids in Section 23 0010 Summary of Work.
   2. Base Bid: See drawings for scope of work that involves installation of pre-purchased equipment, including but not limited to DX splits, RTUs, CHW AHUs, VFDs, etc.
      a. Provide all new controls, control points, sensors, end devices, contactors, relays, CTs, wiring, enclosures, engineering, programming, sequences, graphics for a new and fully operational system.
   3. Alternate Bid: See drawings for scope of work that involves replacement of zone dampers and bypass dampers with new equipment and related controls.
      a. For replaced HVAC systems, provide all new controls, control points, sensors, end devices, contactors, relays, CTs, wiring, enclosures, engineering, programming, sequences, graphics. At AHUs that are retained, provide new damper operators and sensors for a new and fully operational system.
   4. Prior to bidding:
      a. Coordinate division of responsibilities with equipment manufacturer such as provision of sensors, equipment startup, proper BACnet integration and troubleshooting.
      b. Visit sites to verify existing systems, locations, conditions, etc.
      c. Include costs associated with gateways, BACnet interface cards, and software and hardware requirements required to integrate unitary controls with the BAS.
      d. Control valves and dampers for replacement equipment.
      e. Relocation of existing controls panels as indicated.

C. Controls Contractor is responsible for all aspects of work related to the complete operational installation of systems. Coordinate with Mechanical and Electrical Contractors prior to bid to coordinate responsibilities for providing and installing components required for Controls System. This includes but is not limited to:
   1. Sensors and devices in air and water distribution systems.
   2. Electrical hardware and components to include 24V and 120V power for all control devices.
   3. Valves, dampers and duct devices.
   4. End devices provided by equipment manufacturer.
   5. Interface devices required to interface with equipment control panels (RTUs, VFDs, etc.)

D. Related Requirements:
   1. For Summary of Work refer to Section 230100.
   2. Section 230993 "Sequence of Operations for HVAC Controls" for control sequences in DDC systems.

1.3 CODE REQUIREMENTS

A. All equipment and material and its installation shall conform to the current requirements of the following authorities, and local amendments:
   1. Occupational Safety and Health Act (OSHA)
   2. International Electric Code (IEC)
   3. International Fire Code
   4. International Building Code
   5. International Mechanical Code
   6. International Plumbing Code
   7. International Energy Conservation Code
   8. UL 916

B. Where two or more codes conflict, the most restrictive shall apply. Nothing in these specifications shall be construed to permit work not conforming to applicable codes.

1.4 ACTION SUBMITTALS

A. All submittals must be in native PDF format, wherein all text is searchable. Submittals which contain scanned documents which are not 'searchable' will be rejected without being reviewed.

B. Product Data: For each type of product include the following:
   1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
   3. Product description with complete technical data, performance curves, and product specification sheets.
   4. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.
   5. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
   6. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

C. System Description:
   1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
   2. General Requirements:

a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.

3. Schematic drawings for each controlled HVAC system indicating the following:
   a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
   b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
   c. A graphic showing location of control I/O in proper relationship to HVAC system.
   d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
   e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
   f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
   g. Narrative sequence of operation.

      1) Contractor is expected to review all specified sequences and submit questions concerning any ambiguities, potential errors or omissions, prior to turning in submittals. Submittals which simply restate control sequences as written in specifications are not acceptable. Submittals must include a restatement of sequences as they will actually be programmed.

4. DDC system network riser diagram; indicate each device connected to network with unique identification for each, communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or fiber-optic cable, network port(s) for connection of an operator workstation or other type of operator interface, etc.
5. Color graphics.
   a. Submit samples and an itemized list of ALL the various graphics pages being proposed for control system. Show layout of pictures, graphics and data displayed, navigation icons, etc.
   b. Graphics for equipment must be schematically correct versus equipment as actually installed (e.g., all sensors, coils, devices, shown in correct locations & sequential order). In all cases, the graphics must be cross-checked with the engineering drawings.
   c. Engineer's approval of submitted sample graphics pages represents preliminary approval and does not preclude the possibility that graphics' deficiencies may be found in subsequent testing and inspections.

D. Software Submittal:

1. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
2. Description and technical data of all software provided and cross-referenced to products in which software will be installed.
3. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.
4. Include a flow diagram and an outline of each subroutine that indicates each program variable name and units of measure.

5. Listing and description of each engineering equation used with reference source.
6. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
7. Description of operator interface to alphanumeric and graphic programming.
8. Description of each network communication protocol.
9. Description of system database, including all data included in database, database capacity and limitations to expand database.
10. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies showing their relationship to system timing, speed, processing burden and system throughout.
11. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

1.5 INFORMATIONAL SUBMITTALS

A. All submittals must be in native PDF format, wherein all text is searchable. Submittals which contain scanned documents which are not 'searchable' will be rejected without being reviewed.

B. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved.

C. Systems Provider Qualification Data: Resume of project manager, installation and programming technician, and service technicians assigned to Project, including name, phone number, and e-mail address.

D. Product Certificates: Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with ASHRAE 135.

1.6 CLOSEOUT SUBMITTALS

A. As-built record documentation per section 017700 – Closeout Procedures.

B. Operation and Maintenance Data: For DDC system to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    a. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
    b. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing set points and variables.
    c. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
    d. Engineering, installation, and maintenance manuals.
    e. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.
    f. Backup copy of graphic files, programs, and database in electronic media form.
    g. List of recommended spare parts with part numbers and suppliers.
    h. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.

i. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
j. Licenses, guarantees, and warranty documents.
k. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
l. Owner training materials and evidence of the training provided to the owner's staff.
m. For all BACnet-connected devices, on a separate dedicated page, document only selected points readable BACnet points.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Include product manufacturers' recommended parts lists for proper product operation over five-year period following warranty period. Parts list shall be indicated for each year.

1.8 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical circuits for control units.

C. Coordinate equipment with Division 16 Section "Panelboards".

1.9 PAYMENTS

A. 10% of controls cost will be withheld until documentation is provided that the Commissioning and Acceptance Test was carried out, and that it was verified by Engineer.

B. 5% of controls cost will be withheld until documentation is provided that the Training was carried out, and that it was acceptable by the Owner.

1.10 CONTRACTOR RESPONSIBILITY

A. All control items, services, and work shown in specifications and drawings shall be provided by Controls Contractor either directly or by subcontract. These shall include, but are not necessarily limited to, the following:
1. Install control equipment incorporating DDC for energy management, equipment monitoring and control, software, programming, including color graphic workstations.
2. Provide control relays and devices, air flow monitoring devices, pressure and temperature sensing devices, valves, dampers and actuators (unless noted elsewhere in construction documents that they are to be provided by others), etc.
3. Provide electrical work associated with control system and as called for on Drawings. Perform all wiring in accordance with all local and national codes. Provide all line voltage wiring, concealed or exposed, in accordance with Div. 26. All low voltage

electrical control wiring throughout the building when exposed shall be run in conduit in accordance with Division 26. All low voltage wiring run in concealed accessible areas shall be run using plenum rated wire only.

4. Provide 120V power for direct digital control systems PCU's, and LCU's, as defined later in these specifications, and make final panel hook-up and all final electrical connections to each controller. Provide power for all valve, and damper-actuators including VAV boxes.
   a. Power circuit to PCU/LCU shall serve PCU/LCU and no other equipment.
   b. Use spares or provide new circuit breaker.
5. Use spare circuit breakers or provide new where no spares exist.
6. Provide all wiring and conduit for all DDC temperature controls, monitoring devices including DDC signal wiring.
7. Provide all control relays. Where motor starters are not called for or do not exist for 1-phase equipment, provide relays and contactors as required for start/stop control by BAS.
8. Provide surge transient protection shall be incorporated in design of system to protect electrical components in all primary control units.
9. Provide all warranty related work, products, materials, and labor.
10. Provide all software programming.
11. Provide consulting and programming services to Owner and Installing Contractor as required to resolve operating problems after system installation.
12. Provide shop drawings indicating equipment locations, points allocation, and schematic wiring. Submittals shall indicate all information pertinent to PCU locations, PCU capacity and spare points, input/output module configuration within PCUs, communication trunks, sensors, valves, pneumatic interface, wiring, and other pertinent equipment information requiring approval prior to field installation. Provide a DDC system riser diagram showing buildings, controller or device within each building, and listing equipment controlled or monitored by each.
13. Provide graphics programming, showing floor plans of all buildings, equipment locations, and operating parameters.
14. Provide self-commissioning of system.
15. Provide reference manuals.
16. Provide Owner training.
17. Warranty work.
18. Other services, materials, and products as called for in construction documents.

B. The following equipment and services shall be coordinated with the Owner:
   1. A network connection made available for BAS, at a location designated by the Owner.

C. Coordinate with Mechanical Contractor. Mechanical Contractor provides:
   1. Installation of control valves, control dampers, actuators and all manual dampers.
   2. Temporary 24V thermostat for new equipment, if required.
   3. Fan coil units with factory-installed dampers (where indicated).
   4. Rooftop / AH units with factory-installed outside air damper actuator and controls.

1.11 QUALITY ASSURANCE

A. DDC System Manufacturer Qualifications:
   1. Nationally recognized manufacturer of DDC systems and products.
   2. DDC systems with similar requirements to those indicated for a continuous period of ten years within time of bid.
   3. Having complete published catalog literature, installation, operation and maintenance manuals for all products intended for use.
   4. Having full-time in-house employees for the following:

a. Product research and development.
b. Product and application engineering.
c. Product manufacturing, testing and quality control.
d. Technical support for DDC system installation training, commissioning and troubleshooting of installations.
e. Owner operator training.

B. DDC System Provider / Installer Qualifications:
1. A direct factory owned office of the manufacturer, for the brand or make of control equipment to be supplied, with engineers capable of providing instructions, routine maintenance, design services, programming, and emergency system service on staff.
2. Project supervisor and programmers shall be DDC system manufacturer employees. Only construction services not directly related to DDC system operation (such as provision of electrical power, conduit installation and wire-pulling, etc.) may be subcontracted to non-manufacturer workers.
3. A manufacturer's employee working on this project shall be officed within 40 miles of Project and assigned to support Project during warranty period.
4. Each manufacturer employee assigned to Project shall be a competent and experienced full-time employee with demonstrated past experience on at least 5 projects of similar complexity, scope and value.

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.
1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.
2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.
a. Install updates only after receiving Owner's written authorization.

3. Warranty service shall occur during normal business hours and commence no later than 8 hours following Owner's warranty service request.
4. Warranty Period: **Two years from date of final system acceptance**.

a. Final Acceptance of system is not related to nor dependent upon Substantial Completion. **Final system acceptance will be granted only after system is operating without any substantive problems for a minimum of 30 consecutive days, and all issues on Commissioning Issues Log and Engineer's punch lists have been resolved.**

b. Obtain formal written approval from Engineer and Owner contractual date of system Final Acceptance. Determination of final system acceptance date is at Engineer's discretion, in coordination with input from commissioning agent

B. Warranty Inspections
1. At approximately 12 months and 24 months after Final Acceptance of control system, provide a minimum 5 hour on-site inspection of system.
2. Inspection will include an evaluation of performance of the system, including an accuracy of all sensors (re-calibration or replacement is required for sensors obviously inaccurate), solicitation of operator's input of system problems and inadequacies, review

of operating sequences and alarm logs to discover potential recurring problems or nuisances, discovery of any failed points, and general system reliability.

3. **Provide a written report of each site visit summarizing activities and findings, and recommendations for improving system performance.**
4. **Failure to provide the on-site inspections at a time near that specified, or by the end of Warranty, regardless of whether specifically requested by owner, does not relieve contractor of obligation to provide such inspections.** Within a period of 5 years after system Final Acceptance, should owner request contractor provide a system inspection that *was not provided* within the 24 months period after Final Acceptance, contractor will provide such inspection in compliance with subparagraphs 2 and 3 above. Any and all control system deficiencies found are to be remedied as warranty items.

1.13 EXTRA MATERIALS

A. Furnish quantity indicated of matching product(s) in Project inventory **for each unique size and type** of following:
   1. Room Relative Humidity Sensor and Transmitter: Five.
   2. Adjustable Range Room Temperature Sensors: Five.
   3. CO2 sensor: Five.
   4. Current-Sensing Relay: Five.

1.14 EQUIPMENT AND SOFTWARE UPDATES / UPGRADES / REVISIONS

A. Equipment: All equipment, components, parts, materials, etc. provided shall be fully compatible with all other equipment provided at any other time throughout the warranty period. Should updated versions be provided that are not fully compatible with earlier equipment provided (e.g.: a requirement to add hardware or software "interfacing" between an earlier and later generation results in the system not being fully compatible), Controls contractor shall replace earlier equipment with the later version at no cost to Owner.

B. Software: If acceptable to the Owner, all software upgrades applicable to the system and offered by the manufacturer / contractor for this system shall be provided at no cost to the Owner throughout the warranty period. This no cost upgrade shall include installation, programming, modification to field equipment, data base revisions, etc. all as appropriate.

C. Revisions: Hardware / software revisions made related to refining sequences of control, adding/monitoring control points, or other similar operations shall be made with all "burn-in" performed at the contractor's expense, throughout the warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Following Manufacturer's are allowed to bid on this project:
   1. Basis of Design: Automated Logic Controls

2.2 DDC SYSTEM DESCRIPTION

A. Modular, microprocessor-based, high-speed, peer-to-peer network of distributed DDC controllers, operator interfaces, and software monitoring and control, including analog/digital

conversion and program logic, utilizing stand-alone controllers operating over a local area network allowing peer-to-peer communication among all system controllers, and communications interface to Owner’s Central Operator's Station.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

A. DDC system shall be Web based.
   1. DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet.
   2. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.
   3. Web-Compatible Access to DDC System:
      a. Operator workstation and server shall perform overall system supervision and configuration, graphical user interface, management report generation, and alarm annunciation.
      b. DDC system shall support Web browser access to building data. Operator using a standard Web browser shall be able to access control graphics and change adjustable set points.
      c. Web access shall be password protected

2.4 PERFORMANCE REQUIREMENTS

A. Network Bandwidth: Design each network of DDC system to include at least 30 percent available spare bandwidth with DDC system operating under normal and heavy load conditions indicated. Calculate bandwidth usage and apply a safety factor to ensure that requirement is satisfied when subjected to testing under worst case conditions.

B. System Response Time:
   1. Graphic display refresh shall update within eight seconds.
   2. AI point value shall update within 5 seconds, BI point values within 10 seconds.
   3. AO and BO points shall begin to respond to controller output commands within three second(s).
   4. Alarms of analog and digital points connected to DDC system shall be displayed within 15 seconds of activation or change of state.
   5. Global commands shall also comply with this requirement.

C. Future Expandability:
   1. DDC system size shall be expandable to an ultimate capacity of at least four times total I/O points indicated.
   2. Additional DDC controllers, I/O and associated wiring shall be all that is needed to achieve ultimate capacity. Initial network infrastructure shall be designed and installed to support ultimate capacity.
   3. Operator interfaces installed initially shall not require hardware and software additions and revisions for ultimate capacity.

D. Environmental Conditions for Controllers, Gateways, and Routers:

1. Products, instruments, and actuators shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.
   a. If product alone cannot comply with requirement, install product in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, cooled and ventilated as required by product and application.

2. Products shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Products not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:
   a. Outdoors, Protected: Type 3.
   b. Outdoors, Unprotected: Type 4X.
   c. Indoors, Heated with Ventilation: Type 2.
   d. Indoors, Heated and Air Conditioned: Type 1.
   e. Unconditioned Chiller and Boiler Rooms: Type 4X.
   f. Conditioned Mechanical Equipment Rooms: Type 1.
   g. Air-Moving Equipment Rooms: Type 1.
   h. Localized Areas Exposed to Washdown: Type 4X.

E. Electric Power Quality:
   a. Protect DDC system products connected to ac power circuits from power-line surges to comply with requirements of IEEE C62.41. Do not use fuses for surge protection.
   2. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.
   3. Power Conditioning:
      a. Protect DDC system products connected to ac power circuits from irregularities and noise rejection. Characteristics of power-line conditioner shall be as follows:
      b. At 85 percent load, output voltage shall not deviate by more than plus or minus 1 percent of nominal when input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
      c. During load changes from zero to full load, output voltage shall not deviate by more than plus or minus 3 percent of nominal.
      d. Accomplish full correction of load switching disturbances within five cycles, and 95 percent correction within two cycles of onset of disturbance.
      e. Total harmonic distortion shall not exceed 3-1/2 percent at full load.

F. UPS: Provide UPS power protection for Servers, and DDC controllers (except application-specific controllers), and Gateways.

G. Continuity of Operation after Electric Power Interruption: Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.5 PANEL-MOUNTED, MANUAL OVERRIDE SWITCHES

A. Manual Override of Control Dampers:

1. Include panel-mounted, two-position, selector switch for each automatic control damper being controlled by DDC controller. Label each switch with damper designation served by switch, and switch positions to indicate either "Manual" or "Auto" control signal to damper. With switch in "Auto" position signal to control damper actuator shall be control loop output signal from DDC controller.
   a. For Binary Control Dampers: Manual two-position switch shall have "Close" and "Open" switch positions indicated. With switch in "Close" position, damper shall close. With switch in "Open" position, damper shall open.
   b. For Analog Control Dampers: A gradual switch shall have "Close" and "Open" switch limits indicated. Operator shall be able to rotate switch knob to adjust damper to any position from close to open.

2. DDC controller shall monitor and report position of each manual override selector switch. With switch placed in "manual" position, DDC controller shall signal an override condition to alert operator that damper is under manual, not automatic, control.

2.6 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two levels of LANs.
   1. Level one LAN shall connect network controllers and operator workstations.
   2. Level two LAN shall connect application-specific controllers to application-specific controllers.

B. Minimum Data Transfer and Communication Speed:
   1. LAN Connecting Operator Workstations and Network Controllers: 100 Mbps.
   2. LAN Connecting Programmable Application Controllers: 1000 kbps.
   3. LAN Connecting Application-Specific Controllers: 19,200 bps.

C. DDC system shall consist of dedicated LANs that are not shared with other building systems and tenant data and communication networks.

D. System architecture shall be modular and have inherent ability to expand to not less than three times system size indicated with no impact to performance indicated.

E. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

F. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

G. Special Network Architecture Requirements:
   1. Air-Handling Systems: For control applications of an air-handling system that consists of air-handling unit(s) and VAV terminal units, include a dedicated LAN of application-specific controllers serving VAV terminal units connected directly to controller that is controlling air-handling system air-handling unit(s).

2.7 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:
   1. Desktop and portable operator workstation with hardwired connection through LAN port.
   2. Portable operator terminal with hardwired connection through LAN port.

3. Portable operator workstation with wireless connection through LAN router.
4. PDA with wireless connection through LAN router.
5. Remote connection using outside-of-system computer or PDA through Web access.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of desktop or portable operator workstation. Network port shall be easily accessible, properly protected, and clearly labeled.

D. Desktop and Portable Workstations:
1. Connect to DDC system Level one LAN through a communications port directly on LAN or through a communications port on a DDC controller.
2. Able to communicate with any device located on any DDC system LAN.
3. Able to communicate remotely with any device connected to any DDC system LAN.
4. Connect to DDC system sub-LANs through a communications port on an application-specific controller, or a room temperature sensor connected to an application-specific controller.
5. Monitor, program, schedule, adjust set points, and report capabilities of I/O connected anywhere in system.

E. Personal Digital Assistant:
1. Connect to system through a wireless router connected to LAN.
2. Able to communicate with any DDC controller connected to DDC system.

F. Critical Alarm Reporting:
1. Operator-selected critical alarms shall be sent by DDC system to notify operator of critical alarms that require immediate attention. System shall send alarm notification to multiple recipients that are assigned for each alarm.
2. Alarms must be set to observe proper time delays and other logic to avoid nuisance tripping.
3. **Coordinate with Owner's representatives to set up Owner's desired alarm notification procedures and methodologies by means including e-mail, text message and pre-recorded phone message to mobile and landline phone numbers.**
4. Any alarm that registers and appears in alarm history or event viewer history must have clear description of what the alarm is and the name equipment.
5. Any alarm that is created by a BACnet signal from controlled/monitored equipment must be read and displayed in alarm history by BAS.
6. Email and text alarm notifications must be sent to designated owner's representatives for any alarm deemed critical by owner or these specifications.
7. Alarms registering must be configured to avoid nuisance and irrelevant alarms, and to avoid repetitive alarm registering with high frequency.

G. Simultaneous Operator Use: Capable of accommodating simultaneous operators that are accessing DDC system through any one of operator interfaces indicated.

2.8 NETWORK COMMUNICATION PROTCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to public and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be a required protocol used throughout entire DDC system. The Web Server shall support the BACnet Interoperable Building Blocks (BIBBS) for Read (Initiate) and Write (Execute) Services.
2. System shall not require use of gateways except to integrate HVAC equipment and other systems and equipment not required to use ASHRAE 135 communication protocol.
    a. Review manufacturer's communications protocols for all systems with which BAS will integrate, and provide gateways as required to allow full communication, such as, for examples, Modbus Application Protocol Specification V1.1b, LonWorks technology using CEA-709.1-C.

2.9 DESKTOP OPERATOR WORKSTATIONS

A. Not Applicable. Use Owner's existing.

2.10 PORTABLE OPERATOR WORKSTATIONS

A. Not Applicable. Use Owner's existing.

2.11 PRINTERS

A. Not Applicable. Use Owner's existing.

2.12 SERVERS

A. Furnish a Web Server to allow daily operations functions, using real-time system data, to be accomplished from any network connected web browser, from within the facility or in remote locations throughout the world.

B. Servers shall include software license(s), and CAT-5e or CAT-6 cable installation between server(s) and network.

C. Operators shall be able to utilize any commercially available browser such as Microsoft Internet Explorer or Netscape Navigator. No additional software shall have to be installed on the client PC for normal operation of the system.

D. All communications between the web browser and web server shall be encrypted using 128 bit SSL encryption.

E. Web server shall be able to be located on the Owner's Intranet or on the Internet.

F. Web server shall have the ability to automatically obtain an IP (Internet Protocol) address using DHCP. Use of static IP addressing shall also be supported.

G. Web server will have adequate capacity to store and serve 500 user defined graphics, and to archive not less than 12 consecutive months of historical data for all I/O points connected to system, including alarms, event histories, transaction logs, trends and other information indicated.

H. Server(s) shall use IT industry-standard database platforms such as Microsoft SQL Server and Microsoft Data Engine (MSDE). The Web browser client shall support Sun Microsystems Java 2 (JRE 1.4.0 or higher) plug-in.

I. Functionality:

1. A minimum of 30 users shall be able to utilize the system device at the same time. Operators with proper security shall be able to:
   a. View graphical information about a facility, change setpoints, perform overrides.
   b. View and change schedules.
   c. View and acknowledge alarms.
   d. View historical information.

2. Operators must enter in a valid unique user name and password to access the system.
3. Operator security: The Web server shall include industry standard security protocols to prohibit access by unauthorized users over the World Wide Web. Provide firewalls between server Web and networks with password protection for access to server from Web server.
4. The web server shall display the same graphics that have been created for the Operators Workstation.
5. Operators with proper access shall be able to configure the web server using their web browser.

J. Web Server Hardware.
1. Provide a solid-state web server. This device may not contain any moving parts including but not limited to cooling fans, disk drives, CD Rom drives etc.
2. All user entered information (web pages, security, etc.) shall be stored in non-volatile memory. System operational information and clock functions shall be backed up by battery or other device for a minimum of 72 hours.

2.13 SYSTEM SOFTWARE

A. System Software Minimum Requirements:
1. Provide all software required for efficient operation of all the automatic system functions required by this specification. Software shall be modular in design for flexibility in expansion or revision of the system. It is the intent of this specification to require provisions of a system which can be fully utilized by individuals with no, or limited, previous exposure to PC's and programming techniques and languages.
2. The software in the system shall consist of both "firmware" resident in the PCU's and "software" resident in the operator work stations. The architecture of the system, and the application software/firmware shall be distributed with no single system component responsible for a control function for the entire Controller LAN. Each PCU shall contain the necessary firmware and I/O capability to function independently in case of a network failure. No active energy management or environmental control sequences shall be resident in the PC work stations. All PC work stations shall be removable from the system without loss of control function - only alarm monitoring, long term history collection, and operator monitor/command/edit functions would be lost.
3. Software: **All software upgrades applicable to the system and offered by the manufacturer / contractor for this system shall be provided at no cost to the Owner throughout the warranty period.** This no-cost upgrade shall include installation, programming, modification to field equipment, data base revisions, etc. all as appropriate.
4. Real-time multitasking and multiuser 32- or 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.
5. Operating system shall be capable of operating DOS and Microsoft Windows applications.
6. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data.

Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.

7. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.
8. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
9. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Basic Interface Description

1. Operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification and industry standard PC application software. The software shall provide, as a minimum, the following functionality: a. Graphical viewing and control of environment
2. Scheduling and override of building operations
3. Collection and analysis of historical data
4. Definition and construction of dynamic color graphic displays
5. Editing, programming, storage and downloading of controller databases
6. Provide a graphical user interface which shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device and "point and click" approach to menu selection. Users shall be able to start and stop equipment or change setpoints from graphical displays through the use of a mouse or similar pointing device.
    a. Provide functionality such that all operations can also be performed using the keyboard as a backup interface device.
    b. Provide additional capability that allows at least 10 special function keys to perform often used operations.

7. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. The mouse shall be used to quickly select and switch between multiple applications. This shall be accomplished through the use of Microsoft Windows or similar industry standard software that supports concurrent viewing and controlling of systems operations. a. Provide functionality such that any of the following may be performed simultaneously, and in any combination, via user-sized windows:
    a. Dynamic color graphics and graphic control
    b. Alarm management coordinated with section 2.04.E.
    c. Time-of-day scheduling
    d. Trend data definition and presentation
    e. Graphic definition
    f. Graphic construction

8. If the software is unable to display several different types of displays at the same time, the EMS contractor shall provide at least two operator workstations.
9. Multiple-level password access protection (minimum of five levels of access) shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.
    a. Level 1 = View all applications, but perform no database modifications
    b. Level 2 = Custodial privileges plus the ability to acknowledge alarms
    c. Level 3 = All privileges except system configuration
    d. Level 4 = All configuration privileges except passwords
    e. Level 5 = All privileges

10. A minimum of 50 unique passwords, including user initials, shall be supported.
11. Operators will be able to perform only those commands available for their respective passwords. Menu selections displayed shall be limited to only those items defined for the access level of the password used to log-on.
    a. The system shall automatically generate a report of log-on/log-off time and system activity for each user.
    b. User-definable, automatic log-off timers of from 5 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices on-line.

12. Software shall allow the operator to perform commands including, but not limited to, the following:
    a. Start-up or shutdown selected equipment
    b. Adjust setpoints
    c. Add/modify/delete time programming
    d. Enable/disable process execution
    e. Lock/unlock alarm reporting for points
    f. Enable/disable totalization for points
    g. Enable/disable trending for points
    h. Override PID loop setpoints
    i. Enter temporary override schedules
    j. Define holiday schedules
    k. Change time/date
    l. Automatic daylight savings time adjustments
    m. Enter/modify analog alarm limits
    n. Enter/modify analog warning limits
    o. View limits
    p. Enable/disable demand limiting for each meter
    q. Enable/disable duty cycle for each load

C. Reports and Logs:
1. Reports shall be generated and directed to either CRT displays, printers or disk. As a minimum, the system shall allow the user to easily obtain the following types of reports:
    a. A general listing of all points in the network
    b. List of all points currently in alarm
    c. List of all points currently in override status
    d. List of all disabled points
    e. List of all points currently locked out
    f. DDC Controller trend overflow warning
    g. List all weekly schedules
    h. List of holiday programming
    i. List of limits and deadbands.
    j. Summaries shall be provided for specific points, for a logical point group, for a user-selected group or groups or for the entire facility without restriction due to the hardware configuration of the building automation system. Under no conditions shall the operator need to specify the address of the hardware controller to obtain system information.

2. Include reporting software package that allows operator to select, modify, or create reports using DDC system I/O point data available.
3. Each report shall be definable as to data content, format, interval and date.
4. Report data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on server for historical reporting.

5. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
6. Reports and logs shall be stored on [workstation] [and] [server] hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
7. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

D. Standard Reports: Standard DDC system reports shall be provided and operator shall be able to customize reports later.
1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Alarm history.

E. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report.

F. Scheduling:
1. Monthly calendars for a 24-month period shall be provided which allow for simplified scheduling of holidays and special days in advance.
2. Weekly schedules shall be provided for each building zone or piece of equipment with a specific occupancy schedule.
3. Zone schedules shall be provided for each building zone. Each commandable point may have a unique schedule of operation relative to the zone' s occupancy schedule, allowing for sequential starting and control of equipment within the zone.
4. Holidays and special days shall be user-selected with the pointing device and shall automatically reschedule equipment operation.
5. Collection and Analysis of Historical Data
   a. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or changes of value, both of which shall be user definable. Trend data may be stored on hard disk for future diagnostics and reporting.
   b. Trend data report graphics shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or pre-defined groups of at least 6 points. Provide additional functionality to allow any trended data to be transferred easily to an off-the-shelf spreadsheet package such as Lotus 1-2-3a. This shall allow the user to perform custom calculations such as energy usage, equipment efficiency and energy costs and shall allow for generation of these reports on high-quality plots, graphs and charts.

2.14 GRAPHICS

A. Provide Central Operator's Station with software and hardware as needed to meet requirements specified herein. Graphics are to be online programmable and under password control.

B. System shall be provided with complete color graphics software package, such that graphics can be created by user from time of software installation, without need for additional hardware or software. Each operator work station shall support not less than 1,000 separate graphic pages.

Contractor shall include developed graphics as approved by the Owner's representative for this project.

C. Graphics program shall be fully user interactive, full color, incorporating the following capabilities:
   1. Up to 50 dynamic points of data per graphic page
   2. Animated objects for discrete points to illustrate point status
   3. On-line 'draw' utility
   4. Ability to import .PCX or .DXF file format graphics developed in third party programs
   5. "Page Linking" such that it is possible to "zoom" into a specific AHU or any other page through a sequence of graphics without using anything but the system mouse.
   6. Generate, store, and retrieve library symbols for use in generating graphic pages.
   7. Fifty (50) dynamic points of data per graphic page.
   8. Pixel level resolution. Graphics will be displayed on EGA monitors with a 640 X 350 resolution, and on VGA monitors with a 640 X 480 resolution, minimum. Color selections will be made from a color bar consisting of 16 colors, with adjacent text description.
   9. Animated objects for discrete points (i.e., when a pump starts, the pipe fills with water or when a damper shuts it goes closed on the screen).
   10. Analog bar graphs for analog points. The operator shall be able to locate up to 60 bar graphs per graphic page, with options as to bar graph color, dimensions, horizontal/vertical orientation, and limit values.

D. Provide for import of .PCX file format graphics developed in third party programs such as Paintbrush. Such imported graphics shall be used as a "backdrop", so that all other dynamic and animated system features may be superimposed on this graphic. Similarly, it shall be possible to import CAD type drawings, by first converting the CAD drawing from .DXF format to .PCX format.

E. The EMS contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g., fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g., constant volume-terminal reheat, VAV, etc.) and electrical symbols, so that Owner may develop graphics.

F. The graphic development package shall use a mouse or similar pointing device in conjunction with a drawing program to allow the user to perform the following:

   1. Define symbols
   2. Position and size symbols
   3. Define background screens
   4. Define connecting lines and curves
   5. Locate, orient and size descriptive text
   6. Define and display colors for all elements
   7. Establish correlation between symbols or text and associated system points or other displays

G. System shall allow graphical displays to be created to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout or any other logical grouping of points which aids the operator in the analysis of the facility. To accomplish this, the user shall be able to build graphic displays that include point data from multiple DCU Controllers including Terminal Equipment Controllers used or DDC equipment.

H. System Configuration and Definition

1. All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.
2. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:
    a. Add/delete/modify stand-alone DDC Controller panels
    b. Add/delete/modify operator workstations
    c. Add/delete/modify application specific controllers
    d. Add/delete/modify points of any type and all associated point parameters and tuning constants
    e. Add/delete/modify alarm reporting definition for points
    f. Add/delete/modify control loops
    g. Add/delete/modify energy management applications
    h. Add/delete/modify time and calendar-based programming
    i. Add/delete/modify totalization for points
    j. Add/delete/modify historical data trending for points
    k. Add/delete/modify custom control processes
    l. Add/delete/modify any and all graphic displays, symbols and cross-reference to point data
    m. Add/delete/modify dial-up telecommunication definition
    n. Add/delete/modify all operator passwords. Add/delete/modify alarm messages

3. Definition of operator device characteristics, DCU Controllers individual points, applications and control sequences shall be performed using instructive prompting software. a. Libraries of standard application modules such as temperature, humidity and static pressure control may be used as "building blocks" in defining or creating new control sequences. In addition, the user shall have the capability to easily create and archive new modules and control sequences as desired via a word processing type format. Provide a library of standard forms to facilitate definition of point characteristics. Forms shall be self prompting and incorporate a fill-in-the-blank approach for definition of all parameters. The system shall immediately detect an improper entry and automatically display an error message explaining the nature of the mistake.
4. Inputs and outputs for any process shall not be restricted to a single DCU Controller, but shall be able to include data from any and all other network panels to allow the development of network-wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).
5. Provide the capability to backup and store all system databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate DCU Controller. Similarly, changes made at the DCU Controllers shall be automatically uploaded to the workstation, ensuring system continuity. The user shall also have the option to selectively download changes as desired.
6. Provide context-sensitive help menus to provide instructions appropriate with operations and applications currently being performed.

I. Alarm Handling Software:
    1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers, gateways, and other network devices.
    2. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.
    3. Alarms display shall include the following:

a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."

b. **"Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."**

c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-5561."

d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

4. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments.
5. Send e-mail, page, text and voice messages to designated operators for critical alarms.
6. Alarms shall be categorized and processed by class.
   a. Class 1:
      1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.
      2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.
      3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.
   b. Class 2:
      1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.
      2) Acknowledgement may be through a multiple alarm acknowledgment.
   c. Class 3:
      1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.
      2) Each new alarm received shall cause an audible sound. Audible sound shall be silenced by "acknowledging" alarm or by pressing a "silence" key.
      3) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgement.
      4) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.
   d. Class 4:
      1) Routine maintenance or other types of warning alarms.
      2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.
7. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.
8. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

J. Trends:
1. Trend all I/O point present values, set points, and other parameters indicated for trending.
2. Trends shall be associated into groups, and a trend report shall be set up for each group.
3. Trends shall be stored within DDC controller and uploaded to hard drives automatically on reaching 75% of DDC controller buffer limit, or by operator request, or by archiving time schedule.
4. Trend intervals shall be operator selectable from 10 seconds up to 60 minutes. Set trend intervals for each I/O point after review with Owner and CxA.
5. When drive storage memory is full, most recent data shall overwrite oldest data.
6. Archived and real-time trend data shall be available for viewing numerically and graphically by operators.

2.15 GRAPHICS PAGES LAYOUT AND QUALITY

A. All proposed graphics pages are to be submitted to engineer for approval prior to uploading to system.
1. After uploading graphics pages to system, cooperate with Engineer and Owner to fine tune graphics pages with respect to layout, formatting, points displayed, etc.

B. Schematic representation of all equipment and system graphics must be accurate and representative of the actual installed field conditions, such as respective locations of indicated devices, air flow patterns, etc. Changes in the field installation, variances in equipment installed versus equipment specified, etc., will require controls subcontractor to revise graphics.

C. Control and monitored points for any system may be presented ***solely*** in tabular form, without graphic representation, only with prior approval of Engineer. Otherwise, a graphical page showing system schematic must be provided for each system.

D. Where Modbus or Bacnet interface with equipment controllers is provided, all readable / writeable points available must be accessible via BAS. Of these total number of points, a limited, select number of critical points must be displayed on a dedicated graphics page, accessible by clicking on the schematic of the equipment/system with which associated.
1. Provide Engineer with latest updated list of Bacnet or Modbus points, names and addresses from equipment manufacturer.
a. Where selected Bacnet points to display are not designated in drawings or these specifications, budget for displaying up to 30 such points to be selected by Engineer and/or Owner from the latest updated list of Bacnet or Modbus points for equipment being monitored.

2. Equipment manufacturer's point names are often unclear or ambiguous as to what they actually reference. Contractor will modify any point text descriptor per Engineer and/or Owner direction so than the meaning is absolutely clear.

E. Building floor plans
1. Building floor plans are to indicate clearly separate HVAC zones. Distinction between HVAC zones may be illustrated by a variety of means acceptable to Engineer, including darker lines surrounding the zone, color variations, superimposed duct layouts, etc. A clear indication of the extent of floor plan served by each unit must be given. Depending upon temperature-dependent color-coding
2. Engineer endeavors to provide current floor layouts in contract drawings. However, Owner may modify buildings by adding doors or walls, etc. If necessary due to changes in building floor plans, revise graphics to show accurate wall and door locations.

3. All building floor plans must indicate final room numbers (exceptions to include only very small rooms which have no thermostat, such as janitor's closets, etc.). Prior to producing floor plan graphics, confirm in writing from Owner and/or Architect what final room numbers are. Graphics display for special purpose rooms, such as Gyms, Cafeterias, Band Halls, etc., must show this generic name of room in addition to room number (if it is indicated on drawings).
4. Locations of all major equipment (VAV boxes, air handlers, exhaust fans, chillers, boilers, pumps, etc.) are to be indicated on floor plans, along with a clear indication of the area each serves.
5. Floor plan graphic of each zone is to be color-coded, displaying different colors to show space conditions are within or out of specified temperature range.
6. All temperature, relative humidity, and CO2 sensors locations are to be indicated on floor plans in actual position where installed. A clear indication of which unit(s) is controlled by that sensor must be given (such as by a dashed or curved line connecting the two).
7. Actual readings of temperature, relative humidity, and CO2 sensors are to be indicated on floor plans. Readings must be strategically placed on graphic screen so that there is no ambiguity whatsoever as to which room(s) the values apply (without having to hover over or click on the values). Where this proves not to be possible given graphical constraints, provide an acceptable method of clarification, such as a line connecting the room sensor symbols to the values.

F. Graphics text
1. All text displayed on graphic must be large enough to be clearly and easily readable. Font colors must be chosen for good contrast against background so that they are clearly and easily readable. Super-position of separate text lines overlapping one another overlapping other iconography, or truncated text is not acceptable.
2. Text wording for labeled points must be clear and easily understood to any person with moderate experience with HVAC systems.
3. Not all text must have identical font and style on each individual graphic page. Use of varying size and style is required and helpful in identifying and distinguishing important values. However, use consistent font size and style for displaying parameters of similar nature or importance.
4. Text for all parameters must be so positioned on graphics screens that it is unquestionably obvious to what symbols, equipment, or values it applies. This is typically done by placing the text very close to the item to which it applies. Where graphics prevent this (e.g. where it would be too crowded and therefore unclear), use arrows or lines connecting value to the item.
5. Equipment indicated in graphics must be identified with the precise name as indicated in drawings in order to facilitate cross-referencing between graphics and drawings. Where equipment name has changed or Owner desires it be changed, make such modification on final graphics pages.
6. Symbols for devices such as smoke detectors, cut-out safety switches, filter dP sensors, heating or cooling coils, etc., must be labeled so that it is unambiguously clear what the symbol represents.
7. Spelling on graphics pages must be correct.

G. Specified Points

1. *At a minimum*, every input and output listed as a point in bid documents must be displayed graphically.

H. Units

1. Units for all parameters are to be listed on graphics screens or other screens. Use the following nomenclature, or other only as approved by Engineer.
   a. Commanded state: On/Off or Off/Enable, as appropriate
   b. Variable speed motor (e.g. fan or pump) commanded speed: % of full speed

      1) It is unacceptable to display BAS output signal to VFD when such signal does not correspond to the actual VFD/fan speed. Coordinate closely with VFD programming such that speed indication on BAS screen exactly matches actual VFD speed. When VFD is off, speed displayed on graphic must show 0%.

   c. Variable speed motor (e.g. fan or pump) speed feedback: % of full speed feedback
   d. Duct static pressure and duct static pressure setpoint: in. WC, or "wc, following by 'setpoint' when value displayed is the setpoint
   e. Temperature: ˚F, or deg F, or simply 'F'

      1) Outside air temperature: OAT
      2) Discharge or supply air temperature: use either DAT or SAT
      3) Return air temperature: RAT

   f. Relative humidity: % RH
   g. Valve or damper analog output commanded position: % open

      1) For cooling tower bypass valves, add descriptive text such as "% open to bypass")

   h. Valve or damper analog output feed back position: % open / position feedback
   i. CO2 reading and CO2 setpoint: ppm
   j. Hydronic system pressure: psi
   k. Hydronic system differential pressure: psi dP, or psi ΔP
   l. Chiller cooling load: Tons
   m. Refrigerant system pressure: psi
   n. Alarm state of any point: Alarm / Normal
   o. Air flow: CFM
   p. Water flow: GPM
   q. Light level: fc (footcandles)
   r. Filter status: Dirty / Clean for digital, in. WC, or "wc for analog
   s. Power and energy: kWh, kW, KVA.
   t. Power factor: PF

2. For any additional parameters not specifically listed above, use similarly descriptive, standardly accepted units designations, approved by Engineer.
3. Consistent nomenclature for points must be used throughout all graphics pages.
4. Graphics text MUST distinguish between On/Off and Off/Enable digital output points. Typical Off/Enable items include chillers, boilers, DX units, etc. Typical On/Off items include fan motors, pumps, etc. Do not indicate a status or command value of "ON" for equipment that is actually controlled as Off/Enable.
5. **Numerical values for all units are to be displayed to decimal point values truncated to a level commensurate with the accuracy of the sensor.** Unless otherwise noted, display values to the following decimal accuracy:
   a. List to 0 decimal points accuracy: Variable speed drive speed, relative humidity, % valve and damper position, CO2 concentration, water flow, air flow, gallons, kWh, KVA, kW, amps.

b. List to 1 decimal point accuracy: Temperature sensor inputs, temperature setpoints, duct static pressure, and voltage.
c. List to 2 decimal point accuracy: Building static pressure, Power Factor.

I. Reset schedules
1. ALL reset schedules specified in operating sequences must be clearly indicated on the screen of the equipment to which it applies. (For example, a chilled water supply temperature reset schedule versus outside air temperature must be listed on the chiller graphic page.) All values in this reset schedule are to be operator adjustable by clicking on the value within the reset schedule.

J. Forced parameters
1. Provide a clear indication on graphic screen when automatic control or readout of *any* point (command or status, input or output, analog or digital) has been overridden (usually referred to as being placed in Operator or Forced or Manual mode). This may be done in a variety of ways acceptable to engineer (such as placing a large, bold M next to the point, having the point value flash red, placing a dashed rectangle around it, etc.)
2. The indication of a point being in Forced mode must be placed on the main graphic screen of the equipment such that Operator is not required to access other backup screens to see which points are Forced.

K. Provide navigation icons or "linkages" for major systems pages or major equipment items to allow the operator to switch quickly from one major system or building area screen to another.

L. Indication of equipment Status
1. Graphics must make clear with no ambiguity the meaning of the term "Status" (often as applied to equipment such as boilers and chillers, the meaning is not intuitively clear).
a. When Status indicates presence or absence of an alarm, it must be labeled "Alarm Status".
b. When Status indicates an actual on/off or operating state of equipment, specifically indicate what status is being provided. For example, if the Status point reads whether the burner is firing or not, it must be labeled "Burner Status"; if the Status point reads whether a chiller compressor is On or not, it must be labeled "Compressor Status"; if the Status point simply indicates whether a piece of equipment has received an Enable command or not, it must be labeled "Status: Equipment Enabled".

2.16 DDC CONTROLLERS

A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network. The digital system controllers shall perform full control automation functions regardless of the condition of communications with the Central Operator's Station.

E. Environment Requirements:
1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F.
3. Controllers located outdoors shall be rated for operation at 32 to 150 deg F.

F. Power and Noise Immunity:
1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within 36 inches (900 mm) of enclosure.

G. DDC Controller Spare Processing Capacity:
1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:
   a. Network Controllers: 50 percent.
   b. Programmable Application Controllers: Not less than 50 percent.
   c. Application-Specific Controllers: Not less than 50 percent.

2. Memory shall support DDC controller's operating system and database and shall include the following:
   a. Monitoring and control.
   b. Energy management, operation and optimization applications.
   c. Alarm management.
   d. Historical trend data of all connected I/O points.
   e. Maintenance applications.
   f. Operator interfaces.
   g. Monitoring of manual overrides.

H. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:
1. Network Controllers:
   a. 20 percent of each AI, AO, BI, and BO points connected to controller.
   b. Minimum Spare I/O Points per Controller:
      1) AIs: Two.
      2) AOs: Two.
      3) BIs: Two.
      4) BOs: Two.

2. Programmable Application Controllers:
   a. Minimum Spare I/O Points per Controller:
      1) AIs: Two.
      2) AOs: Two.
      3) BIs: Two.
      4) BOs: Two.

3. Application-Specific Controllers:
   a. Minimum Spare I/O Points per Controller:
      1) AIs: Two.
      2) AOs: Two.
      3) BIs: Two.
      4) BOs: Two.

2.17 NETWORK CONTROLLERS

A. General Network Controller Requirements:
   1. Include adequate number of controllers to achieve performance indicated.
   2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
   3. Controller shall have enough memory to support its operating system, database, and programming requirements.
   4. Data shall be shared between networked controllers and other network devices.
   5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
   6. Controllers shall have a real-time clock.
   7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
   8. Controllers shall be fully programmable.

B. Serviceability:
   1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
   2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
   3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.18 PROGRAMMABLE APPLICATION CONTROLLERS

A. General Programmable Application Controller Requirements:
   1. Include adequate number of controllers to achieve performance indicated.
   2. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations. Controllers shall be configured to use stored default values to ensure fail-safe operation.
   3. Controller shall have enough memory to support its operating system, database, and programming requirements.
   4. Data shall be shared between networked controllers and other network devices.
   5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
   6. Controllers that perform scheduling shall have a real-time clock.
   7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
   8. Controllers shall be fully programmable.
   9. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
   10. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.19 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

2.20 SENSORS & FIELD DEVICES

A. All sensors and field devices shall be of commercial grade quality and shall be installed according to the manufacturer's recommendations. Outdoor damper actuators shall be rated for exterior service and provided in weatherproof UV-inhibited housing.

B. Temperature Sensors (General)
1. All temperature inputs for the automation system shall be derived directly from analog inputs from electronic temperature sensors. Transducing of pneumatic sensor signals shall not be acceptable.
2. Temperature sensing elements shall be RTD type, thermistor type, or solid state sensors, as specified in drawings or points list. All sensors of a particular type shall be from the same manufacturer.
3. Characteristics for temperature sensors:
   a. Interchangeability of +/- 0.2% at the reference temperature.
   b. Time constant response to temperature change shall be less than three seconds per degree F.
   c. Sensors shall be linear, drift free, and require only a one time calibration. Sensing elements shall be factory calibrated.
   d. The sensing elements shall be hermetically sealed.
   e. Additional linearizing, ranging, and lead length compensation may be accomplished in software if required to meet the accuracies specified within.
4. Expected temperature sensor operating range and end to end accuracy, including errors associated with sensor, transmitter (if applicable), leadwire and A/D conversion shall be as follows:

Sensed Element	Expected Oper. Range	Sensor Accuracy
a. Return air	40 to 100˚F	0.5˚F
b. Indoor space temperature	40 to 100˚F	0.5˚F
c. Outside air	0 to 125˚F	0.5˚F

C. Adjustable Limited Range Wall Temperature Sensors (Thermostats)
1. General: All wall sensors installed as part of this project shall have adjustable limited range setpoint adjustment function.
   a. 10K-2-R-SOD (10K, DA, Cool / Warm, OVR). Override option shall be provided.
   b. Setpoint limits shall be adjustable via the COS and password protected.
   c. Unit shall have a built in processor and shall communicate with local controller.
   d. Unit shall have an LCD display for space temperature and on / off state
   e. Unit shall have a password protection function to restrict access to service mode.
   f. Provide extra thermostats: 5 of each type.
2. Following areas shall have sensors with override option in addition to adjustable setpoint range function: all sensors in Administration, Gym, Hallways.

D. Humidity Sensors: Bulk polymer sensor element.

1. Bulk polymer sensor element. Install humidity sensors in the space and not in ductwork unless specifically noted. Coordinate locations of duct mounted sensors with Engineer.
   a. Accuracy: 5 percent full range with linear output.
   b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.
   c. Duct and Outside-Air Sensors: With element guard and mounting plate.

E. Carbon Dioxide (CO2) sensors:

1. CO2 sensor shall monitor indoor carbon dioxide (CO2) levels in accordance with ASHRAE standard 62-2004. Complete kit shall include optional aspiration box for mounting sensor inside return air duct.
2. Sensor shall have a 4 - 20 mA linear output over a range of 0 - 5000 ppm of CO2. A SPDT shall be provided for local control or alarm output.
3. **Provide sensor with LCD readout.**
4. Power: 24VAC or DC at 400mA max.
5. Measuring range: 0-2000 ppm
6. Accuracy: 40 ppm + 2% of reading
7. Analog output: 4-20 mA
8. Control relay: N.O. SPST, 0.75 amp at 24VAC/VDC
9. Operating temperature: 32° - 122°F
10. Operating humidity: 5-95% non-condensing
11. Calibration adjustment: zero to span
12. Min. req. calibration: One year
13. Unit enclosure: UL fire rated
14. Aspiration box: High impact styrene

F. Equipment operation sensors as follows:
1. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
2. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

G. Equipment on/off control shall use either momentary pulsed relays or magnetically latched relays, as appropriate for the equipment's control starter. Interfacing controls shall be configured such that in its last commanded state. All equipment safeties and interlocks shall remain active, and will not be bypassed by new EMS controls. For motors with VFDs provide On/Off Control as appropriate VFD terminals.

H. Motor On/Off Status: Unless otherwise specified, status shall be proven using current sensing relays connected at VFDs and calibrated for minimal operating speed.

I. Pressure Sensors: Pressure sensors and differential pressure sensors shall be piezo-resistive strain-gauge with temperature compensation. Sensors shall be selected to provide linear indication with an adequate span for the application. Sensor shall be 0 - 10 V or 4 - 20 mA. Insure sensors are rated to operate at temperature of sensed media. Sensors shall have an accuracy of 1% of full scale. Sensors shall accept overpressures of at least 120 psig, at any port, without damaging the sensor.

J. Watthour Transducers: Shall have an accuracy of +/- 2.5% at 0.5 power factor to 2.0% at 1 power factor for KW and KWH outputs. Output signals for KW and KWH shall be internally selectable without requiring the changing of current or potential transformers. Current and potential transformers shall be in accordance with ANSI C57.13.

K. Voltage Outputs: Variable voltage outputs shall provide a voltage signal from 0 to 20 volts. All voltage outputs shall be fuse protected against shorts to 120 volts AC and capable of withstanding a short ground indefinitely. All voltage outputs shall be protected against + or - 1500 volts, 50 microseconds transients. Voltage outputs shall have a resolution of 0.1 volts.

L. Current Outputs: Variable current outputs shall be a sinking type and shall provide 0 to 20 milliamps with a resolution of 0.1 mA and a compliance of 20 volts minimum. All current outputs shall be fuse protected to 120 volts AC and protected against + or - 1500 volts, 50 microsecond transients.

M. Pressure Sensors: Pressure sensors and differential pressure sensors shall be piezo-resistive strain-gauge with temperature compensation. Sensors shall be selected to provide linear indication with an adequate span for the application. Sensor shall be 0 - 10 V or 4 - 20 mA. Insure sensors are rated to operate at temperature of sensed media. Sensors shall have an accuracy of 1% of full scale. Sensors shall accept overpressures of at least 120 psig, at any port, without damaging the sensor.

N. Motor On/Off Status: Unless otherwise specified, status shall be proven using current sensing relays connected at VFDs and calibrated for minimal operating speed.

O. Hardware Overrides: A three position manual override switch shall allow selection of the ON, OFF, or AUTO outputs state for each output point. In addition, all analog output points shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

P. Damper Actuators
   1. Electronic direct-coupled actuation shall be provided.
   2. The actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assemble shall be of a 'V' bolt design with associated 'V' shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a 'V' clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or screw type fasteners are not acceptable.
   3. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
   4. For power failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.
   5. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
   6. Proportional actuators shall accept a 0 to 10VDC or 0 to 20mA control input and provide a 2 to 10VDC or 4 to 20mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. All actuators shall provide a 2 to 10VDC position feedback signal.
   7. All 24VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC shall not require more than 11VA.

8. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque shall have a manual crank for this purpose.
9. All modulating actuators shall have an external, built-in switch to allow reversing direction of rotation.
10. Actuators shall be provided with a conduit fitting and a minimum 3ft electrical cable and shall be pre wired to eliminate the necessity of opening the actuator housing to make electrical connections.
11. Actuators shall be Underwriters Laboratories Standard 873 listed and Canadian Standards Association Class 4813 02 certified as meeting correct safety requirements and recognized industry standards.
12. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of installation. Manufacturer shall be ISO9001 certified.

Q. Field Testing and Programming Equipment: A portable laptop or notebook computer shall interface via standard push-in connection at an asynchronous serial port located at the Control modules and at selected enhanced zone temperature sensors as indicated on project plans. This portable unit shall be capable of full global communications with all Control modules connected within the respective network and shall provide functionally identical user interface to the Workstation, in non-graphic format. Units shall be able to interrogate all points and alter all programming.

2.21 ENCLOSURES

A. General Enclosure Requirements:
1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers. Do not house more than one controller in a single enclosure.
2. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
3. Enclosures shall be NRTL listed according to UL 508A.
4. Enclosures constructed of steel, finished inside and out with polyester powder coating electrostatically applied and then baked to bond to substrate.
5. Hinged door full size of front face of enclosure and supported using:
   a. Enclosures sizes less than 36 in. (900 mm) tall: Multiple butt hinges.
   b. Enclosures sizes 36 in. (900 mm) tall and larger: Continuous piano hinges.

B. Internal Arrangement:
1. Internal layout of enclosure shall group and protect components associated with a controller, but not an integral part of controller.
2. Arrange layout to group similar products together.
3. Include a barrier between line-voltage and low-voltage electrical and electronic products.
4. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
5. Terminate field cable and wire using heavy-duty terminal blocks.
6. Include spade lugs for stranded cable and wire.
7. Install a maximum of two wires on each side of a terminal.
8. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.

9. Include enclosure with a line-voltage nominal 20-A GFCI duplex receptacle for service and testing tools. Wire receptacle on hot side of enclosure disconnect switch and include with a 5-A circuit breaker.
10. Mount products within enclosure on removable internal panel(s).
11. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background). The nameplates shall have at least 1/4-inch- (6-mm-) high lettering.
12. Route tubing cable and wire located inside enclosure within a raceway with a continuous removable cover.

C. Environmental Requirements:
1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.
2. Calculate enclosure internal operating temperature considering heat dissipation of all products installed within enclosure and ambient effects (solar, conduction and wind) on enclosure.
3. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.
4. Where required by application, include temperature-controlled ventilation fans with filtered louver(s) to maintain inside of enclosure below maximum operating temperature of product with most stringent requirement.
5. Include temperature-controlled cooling within the enclosure for applications where ventilation fans cannot maintain inside temperature of enclosure below maximum operating temperature of product with most stringent requirement.
6. Where required by application, include humidity-controlled electric dehumidifier or cooling to maintain inside of enclosure below maximum relative humidity of product with most stringent requirement and to prevent surface condensation within enclosure.

2.22 RELAYS

A. All:
1. Heavy duty, rated for at least 10 A at 250-V ac and 60 Hz.
2. Construct the contacts of either silver cadmium oxide or gold.
3. Relay enclosed in a dust-tight cover.
4. Coil transient suppression to limit transients to non-damaging levels.
5. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
6. Mechanical Life: At least 10 million cycles.
7. Electrical Life: At least 100,000 cycles at rated load.
8. Timing Ranges: Multiple ranges from 0.1 seconds to 100 minutes.
9. Timing Ranges, where applicable: Multiple ranges from 0.1 seconds to 100 minutes.
10. Repeatability: Within 2 percent.
11. Recycle Time: 45 ms.
12. Minimum Pulse Width Control: 50 ms.
13. Power Consumption: 5 VA or less at 120-V ac.
14. Ambient Operating Temperatures: Minus 40 to 115 deg F (Minus 40 to 46 deg C).
15. General-Purpose Relays: With LED indication and a manual reset and push-to-test button.
16. Multifunction Time-Delay Relays: With knob and dial scale for setting delay time.

B. Current Sensing Relay:
1. Monitors ac current.

2. Independent adjustable controls for pickup and dropout current. Choose relay size to be able to read smallest current from motor at lowest speed.
3. Energized when supply voltage is present and current is above pickup setting.
4. De-energizes when monitored current is below dropout current.
5. Dropout current adjustable from 50 to 95 percent of pickup current.
6. Include a current transformer, if required for application.
7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

2.23 UNINTERRUPTABLE POWER SUPPLY (UPS) UNITS

A. 250 through 1000 VA:
1. UPS units shall provide continuous, regulated output power without using their batteries during brown-out, surge, and spike conditions.
2. Load served shall not exceed 75 percent of UPS rated capacity, including power factor of connected loads.
3. UPS shall provide up to 15 minutes of battery power.
4. Performance:
   a. Input Voltage: Single phase, 120- or 230-V ac, compatible with field power source.
   b. Load Power Factor Range (Crest Factor): 0.65 to 1.0.
   c. Output Voltage: 101- to 132-V ac, while input voltage varies between 89 and 152-V ac.
   d. On Battery Output Voltage: Sine wave.
   e. Inverter overload capacity shall be minimum 150 percent for 30 seconds.
   f. Recharge time shall be a maximum of six hours to 90 percent capacity after full discharge to cutoff.
   g. Transfer Time: 6 ms.
   h. Surge Voltage Withstand Capacity: IEEE C62.41, Categories A and B; 6 kV/200 and 500 A; 100-kHz ringwave.

5. UPS shall be automatic during fault or overload conditions.
6. Include front panel with power switch and visual indication of power, battery, fault and temperature.

2.24 SURGE PROTECTION

A. Zener diodes, silicone avalanche diode, optical isolation, varistors, or combination thereof.

B. Transient protection
1. Communications LAN:
   a. Provide surge protection equipment sized specifically for expected operating current of LAN.
   b. Exceeds severity level 4 of IEC 801-4.
   c. Operating voltage: 12 volts.
   d. Maximum operating current: 200 mA
   e. Clamping action turn-on: 14.3 volts
   f. Maximum clamping at 2 kW (8 x 20 microsecond wave): 22 volts
   g. Maximum surge voltage: 20 kV
   h. Maximum surge current (8 x 20 microsecond wave): 2.5 kA
   i. Current leakage at perating voltage: 5 microamps
   j. As manufactured by Surge Control Limited, SPR series, or approved equal.

2. Power supply:
   a. Provide surge protection equipment sized specifically for expected operating current of DDC controller.
   b. Exceed recommendations for ANSI / IEEE C62.41-1991 Categories A3 and B3 and UL1449.
   c. Design such that suppressor does not "wear out" with repeated surges.
   d. CSA certified and UL recognized.
   e. EMI / RFI filtering.
   f. Differential and common mode suppression and filtering.
   g. Less than 5 nanosecond response time.
   h. Maximum transient voltage 6 kV.
   i. Maximum transient current 3 kA.
   j. Minimum clamping turn-on, 210 volts.
   k. Maximum clamping voltage, (l-test):
      1) line to neutral — 245 volts.
      2) line to ground — 245 volts.
      3) neutral to ground — 245 volts.
   l. Maximum clamping voltage @ 3 kA:
      1) line to neutral — 325 volts.
      2) line to ground — 430 volts.
      3) neutral to ground — 430 volts.
   m. As manufactured by Surge Control Limited, SPP-1200 series, or approved equal.

C. Protective devices shall be continuous duty, automatic and self restoring.

2.25 CONTROL WIRE AND CABLE

A. 7/24 soft annealed copper strand with a 2- to 2.5-inch (50- to 65-mm) lay.

B. Plenum rated LAN and Communication Cable complying with NFPA 70 and DDC system manufacturer requirements for network being installed.

2.26 CONTROL POWER WIRING AND RACEWAYS

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

B. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" electrical power conductors and cables.

2.27 IDENTIFICATION

A. Provide engraved phenolic tag, fastened with drive pins with min. 0.5" high white lettering on black background, bearing unique identification nomenclature for control equipment and devices.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Schedule and attend conference at location of owner's choosing. Mandatory attendees include representatives from BAS contractor, Owner, Engineer, and Commissioning Authority.

3.2 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify compatibility with and suitability of substrates. Examine roughing-in for products to verify actual locations of connections before installation. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

B. Prepare written report listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Review proposed control sequences for reasonableness and ability to be programmed. For any sequences which contractor believes are incorrect, unworkable, or incapable of being programmed, clarify with Engineer via RFI prior to uploading control program.

3.3 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Coordinate with Owner for provision of required communication infrastructure that is Owner's responsibility, including data drops, IP addresses, etc.

B. Communication Interface to Equipment with Integral Controls: DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control. Reference drawings for equipment to be connected.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. The I/O Summary on the drawings is provided as a list of the minimum points required. Provide all controls points, temperature sensors, relays, actuators, and devices necessary to achieve operational sequences at no additional cost to the Owner, whether explicitly called for or not in this specification. Coordinate with all sub-contractors to ensure all items are provided and installed.
   1. Controlled and/or monitored points required for proper operation of units may differ by unit manufacturer. If HVAC or other equipment ultimately installed differs from that specified, provide controlled and monitored points required for proper operation as determined by equipment supplier and Engineer.

B. Install in accordance with manufacturer's instructions.

C. Controls Contractor is responsible for complete operational installation of system, including, but not limited to the following:
   1. Electrical power supply to all control system components, including but not limited to; controllers, actuators, sensors, from dedicated circuits in electrical panels.
   2. Complete installation of duct-mounted components, including but not limited to: temperature, relative humidity, pressure, and CO2 sensors, and dampers/actuators.
   3. Complete installation of pipe-mounted components, including but not limited to: control valves and actuators, temperature sensors, pressure sensors.

D. All electrical material and installation shall be in accordance with local applicable codes and requirements of Division 26. All automation system equipment supplied shall be provided with adequate grounding in accordance with the manufacturer's specifications and suggested engineering applications procedures. These requirements shall include, but not be limited to:
   1. A "clean earth ground" for all FCUs and central operator's station.
   2. No "ground mixing" between equipment components.
   3. Insulation of all panels from metal conduits.
   4. Equal-potential grounding for equipment where required.

E. Identification:
   1. Provide a permanent, stick-on tape marker on the inside cover of the space sensor (e.g. temperature, RH) to identify the name of the HVAC unit associated with the sensor.
   2. Provide within each enclosure with a complete set of as-built schematics, tubing, and wiring diagrams and product literature for that particular controller.
   3. Label each end of cable, wire and tubing in enclosures following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection. **Use printed labels, not hand-written.**
   4. Identify all controller enclosures with 1/8 inch thick plastic labels not less than 3 x 1.25 inches. Fasten with stainless-steel rivets or self-tapping screws or contact-type permanent adhesive, compatible with label and with substrate

F. Install products to satisfy more stringent of all requirements indicated.

G. Install products level, plumb, parallel, and perpendicular with building construction. Support products, tubing, piping wiring and raceways. Brace products to prevent lateral movement and sway or a break in attachment.

H. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

I. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

J. Seal penetrations made in fire-rated assemblies and in acoustically rated assemblies in accordance with applicable fire codes.

K. Fastening Hardware:
   1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
   2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
   3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

L. Install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

M. Corrosive Environments:
   1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

a. Laboratory exhaust-air streams.
b. Process exhaust-air streams.

2. When conduit is in contact with a corrosive airstream and environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment. Comply with requirements for installation of raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.5 CONTROLLER INSTALLATION

A. Quantity and location of network and programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.

B. Install controllers in enclosures to comply with indicated requirements in a protected location that is easily accessible by operators.

C. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 DDC SYSTEM I/O CHECKOUT, ADJUSTMENT, CALIBRATION AND TESTING

A. Prepare and submit a report to Engineer and Commissioning Authority documenting results for checking, adjustment, calibration, testing. Include a description of corrective measures and adjustments made to achieve desire results for each I/O point, control sequence, and system.

B. Sensor Check and Calibration:
1. Sensor Check and Calibration: Coordinate with Testing, adjusting, and balancing (TAB) firm to calibrate all sensors and provide report of findings.
a. All sensors not accurate within range specified and submitted are to be replaced.
b. Add an offset to those sensors which are inaccurate, but are within specified and submitted range, so that they read accurately.
c. CO2 sensors' calibration is typically verified by TAB contractor at a single point in time, and does not prove accuracy at higher or lower ends of the sensors' expected operating range. Contractor must verify sensor accuracy at high and low ends of expected range by the following means:
1) Low end: Take CO2 sensor readings near the end of a 3-day period when school has been mostly or entire unoccupied, and prior to its being re-occupied. CO2 should read in the 410 – 440 ppm range. Unless contractor

knows of logical reason sensors should read outside this range, make sensor adjustment / replacement as per a. and b. above.

2) High end: Observe CO2 sensor readings over a minimum of 5 days when school is heavily occupied. CO2 should read no higher than 1200 – 1400 ppm. For sensors which read higher than 1400ppm for any period of time > 20 minutes:
   a) Verify proper operation of HVAC equipment responsible for providing outside air ventilation. **Coordinate this verification in conjunction with mechanical (other other) subcontractor, as the issue may be due to improper mechanical operation.**
   b) Re-verify sensor accuracy at a time when it is reading at a high (1300ppm or greater) value.
   c) Make sensor adjustment / replacement as per a. and b. above.

C. Control Damper Checkout:

1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Stroke and adjust control dampers following manufacturer's recommendation, from 100 percent open to 100 percent closed and back to 100 percent open. Verify that damper blade travel is unobstructed and that damper actuator and linkage attachment is secure.
6. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
7. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

D. Switches: Calibrate switches to make or break contact at set points indicated.

E. Controllers:
1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.
6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.
7. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.
8. Verify that spare I/O capacity is provided.
9. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance. Test every I/O point throughout its full operating range.
10. Test every control loop to verify operation is stable and accurate.
11. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
12. Test and adjust every control loop for proper operation according to sequence of operation.
13. Test software and hardware interlocks for proper operation. Correct deficiencies.
14. Operate each analog point at upper, mid, and lower portions of range
15. Exercise each binary point.

16. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.

3.8 DDC SYSTEM COMMISSIONING TESTS

A. Provide written request to Commissioning Authority (CxA) for initiation of on-site Functional Testing. Functional Testing will not take place until:
   1. System has been thoroughly tested as described in this section under "DDC System I/O Checkout, Adjustment, Calibration, And Testing", and report has been submitted.
   2. Certificate of Readiness has been submitted to CxA.
      a. Submit Certificate of Readiness only when confirmed that system is operating perfectly, and in accordance with specifications and drawings requirements. Only minor exceptions to this requirement are allowable, and must be clearly described in the submitted Certificate of Readiness
      b. At his discretion, if entire control system has not been completed, CxA may test portions of system which have been completed.

   3. Prefunctional Checklists, if required by contract documents, have been submitted to CxA.

B. Contractor shall set up trend logs as requested by the CxA, Engineer, or Owner, without any limits on the number of trends, to assist in testing and verification of system operation.
   1. Prior to start of functional testing, set up trend logs as follows (* *as applicable* to systems, equipment, and BAS points provided on this project):

      a. Set all trend logs to record and maintain minimum 72 hours worth of readings.
      b. All CHW air handlers: Trend the following points, as applicable to unit:
         1) Readings every change of value:
            a) Fan status
         2) Readings every 2 minutes:
            a) Return air CHW coil leaving air temperature
            b) Outside air CHW coil leaving air temperature
            c) Mixed air temperature
            d) Heater status
            e) Unit discharge air temperature (might be same as heater leaving air temperature)
            f) Heater leaving air temperature (might be same as unit discharge air temperature)
         3) Readings every 15 minutes:
            a) Static pressure
            b) Static pressure setpoint
            c) Fan speed
            d) Space temperature
            e) Return air temperature
            f) Return air relative humidity
            g) Return air and/or space CO2
            h) Outside air damper position
            i) Outside air temperature
      c. All DX package and split systems: Trend following points, as applicable to unit:
         1) Readings every change of value:
            a) Fan status
            b) Compressor status, each stage or each compressor
            c) Reheat / dehumidification status

d) Heater status (stepped heaters), each stage
e) Heater status (SCR), each 15% COV

2) Readings every 2 minutes:
a) Unit discharge air temperature
b) DX cooling coil leaving air temperature
c) Outside air CHW coil leaving air temperature

3) Readings every 15 minutes:
a) Static pressure
b) Static pressure setpoint
c) Fan speed
d) Space temperature
e) Return air temperature
f) Return air relative humidity
g) Return air and/or space CO2
h) Outside air damper position
i) Outside air temperature

d. Variable air volume boxes: Trend the following points, as applicable to unit:
1) Readings every change of value:
a) Fan status (fan-powered box)
b) Heater status (stepped heaters), each stage
c) Heater status (SCR), each 15% COV

2) Readings every 5 minutes:
a) Unit discharge air temperature

3) Readings every 15 minutes:
a) Space temperature
b) Space relative humidity
c) Space CO2
d) Damper position
e) CFM
f) CFM setpoint

e. Exhaust & ventilation fans: Trend the following points, as applicable to unit:
1) Readings every change of value:
a) Fan status
b) Fan Command (on/off or Off/Enable)

f. Electric Power Meters: Trend the following points, as applicable:
1) Readings every 15 minutes:
a) kW
b) Power Factor
c) Amps, all legs

C. CxA will perform on-site and remote Functional Testing as specified in Construction Documents and in accordance with generally accepted commissioning procedures. DDC system shall demonstrate correct operation and accuracy of monitored and controlled points as well as operation capabilities of sequences, logs, trends, reports, specialized control algorithms, diagnostics, and other software indicated. Reference section 019113 “General Commissioning Requirements” for more information.
1. Contractor is to provide a qualified representative, intimately familiar with the project installation and issues, to carry out Functional Testing procedures as directed by CxA, for the duration of Functional Testing.

D. CxA will issue reports to Contractor, in such forms as Commissioning Issues Logs, emails, written reports, detailing items which appear not to be in conformance with construction documents requirements. Take prompt action to remedy deficiencies indicated in field report

and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

E. Due to the complexity of control systems and potential for latent defects to go undiscovered during Functional Testing, DDC system or tested portions thereof must operate essentially trouble-free for a period of 30 consecutive days following Functional Testing before Final Acceptance of system will be granted.

3.9 WARRANTY SERVICE

A. System deficiencies discovered subsequent to Final Acceptance of system will be treated as Warranty items. Under Warranty requirements, address all operating problems, repair or replace worn or defective components, adjust control parameters as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Provide system inspections and reports annually during warranty period; reference Part 1 paragraph “Warranty Inspections” in this specifications section.

3.10 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning **at Final Acceptance of system**, service agreement shall include software support for two year(s).

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of **Final Acceptance of system**. Upgrading software shall include operating system and new or revised licenses for using software.

3.11 DEMONSTRATION AND TRAINING

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system. Owner may send up to 10 persons to attend training. Training shall occur within normal business hours at a mutually agreed on time.

B. Provide not less than **14** hours of training total, broken up into four 3.5 hour sessions. Provide staggered training schedule as requested by Owner to accommodate Owner personnel schedules.

C. Schedule training with Owner at least four business days before expected Substantial Completion. All training shall occur before Final Acceptance of control system.

D. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate daily operators, advanced operators, and system managers and administrators.

E. Provide each attendee with a color hard copy of all training materials and visual presentations. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter.

F. Instructor Requirements:
1. One or multiple qualified instructors, as required, to provide training.

2. Instructors shall have not less than three years of providing instructional training on not less than five past projects with similar DDC system scope and complexity to DDC system installed.

G. On-Site Training:
1. Provide as much of training located on-site as deemed feasible and practical by Owner. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. On-site training shall include regular walk-through tours to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
4. Operator workstation shall be used in training, whether Owner's or contractor-provided & via remote web access.

H. Training Content:
1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals, and control drawings.
11. Accessing data from DDC controllers.
12. Operating portable operator workstations.
13. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
14. Running each specified report and log, setting up Trend Logs.
15. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
16. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
17. Executing digital and analog commands in graphic mode.
18. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
19. Demonstrating DDC system performance through trend logs and command tracing.
20. Demonstrating scan, update, and alarm responsiveness.
21. Demonstrating spreadsheet and curve plot software, and its integration with database.
22. Demonstrating on-line user guide, and help function and mail facility.
23. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
24. Demonstrating operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
25. Demonstrating integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.

I. Maintain a training attendee list and sign-in sheet. Sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.

1. For each session, submit a scanned copy (PDF) of circulated sign-in sheet to Owner, Engineer, and Commissioning Authority with 48 hours of end of training session. **THE SIGN-IN SHEET PROVIDED FOR CONTRACTOR ON THE LAST PAGE OF THIS SPECIFICATION MUST BE USED. FAILURE TO TURN IN ACCEPTABLE DOCUMENTATION OF TRAINING ON THE PROVIDED TRAINING SIGN-IN SHEET WILL BE TREATED AS IF NO TRAINING TOOK PLACE. CONTRACTOR WILL BE REQUIRED TO PROVIDE AND DOCUMENT ADDITIONAL TRAINING AS SPECIFIED ABOVE.**

TRAINING SIGN-IN SHEET

NAME OF FACILITY: _____

SYSTEM TRAINED: **230900 – INSTRUMENTATION AND CONTROLS**

TRAINER _____
person's name Organization

TRAINING DATE: _____

START / END TIME: Start: End:

TRAINING LOCATION: _____

IN ATTENDANCE (printed name)	SIGNATURE	ORGANIZATION

I CONFIRM TRAINING AS INDICATED ABOVE TOOK PLACE AND WAS SATISFACTORY.

OWNER'S REPRESENTATIVE SIGNATURE _____

END OF SECTION 230900

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections include the following:
1. Division 23 Section "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.
2. Division 23 Sections for DX RTUs.

1.2 ABBREVIATIONS

A. Abbreviations used in this specifications section:

1. BAS: Building Automation System
2. CO2: Carbon Dioxide
3. CxA: Commissioning Agent
4. DAT: Discharge Air Temperature
5. DCV: Demand Control Ventilation
6. DDC: Direct Digital Control
7. dP: differential Pressure
8. dT: differential Temperature
9. DX: Direct Expansion
10. EF: Exhaust fan
11. OA: Outside Air
12. RH: Relative Humidity
13. RTU: Rooftop Unit
14. TAB: Testing, Adjusting and Balancing

1.3 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment. Provide controls and operating sequences for the following HVAC systems at **STISD HVAC Repairs**:
1. Mercedes Campus: Single zone, constant volume, DX split system with electric heat
   a. BAS upgrade to fully control the unit.
2. Olmito Campus: Single zone, constant volume, DX split system
   a. BAS upgrade to fully control the unit.
3. Edinburg Campus, Albert Hughes Building: Single zone, constant volume, DX RTUs
   a. BAS upgrade to fully control the unit.
   b. Provide new motorized OA dampers, and CO2 based DCV.
4. Edinburg Campus, Library Building: Variable volume, hydronic AHUs
   a. Multizone AHU 1: BAS replacement and upgrade
   b. Single zone AHU 2: BAS replacement and upgrade

c. VFD replacements: Disconnect and reconnect existing controls. Retain existing sequences, control points.

5. Edinburg Campus, Kitchen/Cafeteria Building:
   a. DX RTUs: Single zone, constant volume, DX RTUs. BAS upgrade to fully control the unit. Provide new motorized OA dampers, and CO2 based DCV.
   b. VFD replacements: Disconnect and reconnect existing controls. Retain existing sequences, control points.
6. Alternate Bid: Edinburg Campus World Scholar Building: Replacement of existing air distribution system, including zone dampers, zone level controls, and bypass damper. Existing AHUs and related controls will be retained and reused.
7. Common Scope:
   a. Provide new controllers, programming, graphics, sensors, relays, wiring, conduit, programming, and appurtenances as required to control and/or monitor new equipment.
   b. Provide commissioning of sequences.

B. **Prior to bidding**, BAS contractor shall coordinate with equipment supplier and notify general, mechanical and electrical contractor of any work required for operational installation of controls devices that will not be conducted by Controls Contractor. This includes, but is not limited to: installation of controls devices and sensors, and any needs for power wiring and/or conduit.

C. A list of the minimum number and type of control points required is given. Provide any additional points, sensors, gateways, interface cards, etc. as required to achieve sequences, whether specifically called for in Points List or not.

D. All equipment must be listed in strict alpha-numeric order when presented as a part of any tables, summaries, global searches, etc. (For example, to ensure this, unit numbers should begin with **0**, such as VAV-**0**6-02, so that they appear in the list prior to units with numbers -10, -11, -12, etc.)

E. Provide all hardware, software, and labor required to achieve specified sequences.

F. Units or systems that are grouped together for purposes of sequence description are not meant to be controlled together. Each system shall have its own set of adjustable parameters and will respond only to values (space temperatures for example) associated with it. This means that one unit may be in heating mode while another with similar sequence may be in cooling mode.

1.4 EQUIPMENT TIME SCHEDULES

A. Contractor is responsible for programming schedules for all equipment and systems prior to turning system over to Owner at final system acceptance.

B. Initial Construction Time Schedules
   1. HVAC systems are never to be programmed to operate in normal Occupied mode on weekends, nor for more than 12 hours on any Mon-Fri weekday, unless expressly directed to do so by general contractor or Owner, and only for special purposes such as wall dry-out, removing fumes generated during construction, etc.
   2. Inform the CxA of any such special scheduling directions, and of the target date the special schedule will be lifted.

C. Consult with Owner to determine Owner's desired equipment operating schedules, including both Normal and upcoming Holiday schedules, and Program holiday time schedules as per Owner's direction. Immediately after determining Owner's desired schedules, inform CxA in writing of what those schedules are.
   1. Independent dedicated operating schedules MUST be provided for groups of equipment that serve similar floor areas with similar usage patterns. At minimum, provide such dedicated schedules for the following:
      a. Cafeterias
      b. Kitchens
      c. Classrooms
      d. Auditoriums
      e. Libraries
      f. MDF/IDF rooms

D. Optimum Start/Stop (OSS)
   1. The purpose of OSS is to cause the control system to calculate an optimal start time for HVAC so that comfort conditions will be achieved by the scheduled Occupied time.
   2. Do not implement OSS programming for HVAC control unless specifically requested by Owner.
   3. Should Owner indicate desire that OSS be implemented:
      a. Owner must be fully informed of how OSS works; arrange a conference call with Owner and CxA to discuss.
      b. Inform the CxA in writing of Owner directions, and of the target date the special schedule will be lifted.
      c. Program an OSS 'inhibit time' preventing start of unit more than 20 minutes prior to target comfort time.

E. Note that outside air dampers, exhaust fans, or other equipment devices may have independent dedicated time schedule different from the equipment which they serve or are associated with. For example, distinct time schedules may be required for actual Occupied time (for instance, 8AM to 5:30PM) requiring ventilation versus required equipment start/stop times for comfort.

F. Equipment items having the same Off/Enable or Start/Stop times are not to be software interlinked such that one cannot be changed without changing the other. Each individual equipment item is to have its own individual programmable Off/Enable or Start/Stop scheduling capability.

G. Stagger unit start times by a minimum of 20 seconds between starts.

H. Unoccupied hours, Off / Enable:
   1. Enable cooling if space air temperature rises above 90˚F (adj.). Disable unit once temperature has fallen to 85˚F (adj.) or below.
   2. Enable heating if space air temperature drops below 45˚F (adj.). Disable unit once temperature has risen to 55˚F (adj.).
   3. Enable cooling if relative humidity rises above 60% (adj.). Disable unit once relative humidity has fallen to 55% (adj.).
   4. Unit shall run for a minimum of 30 min. (adj.) or until specified conditions are satisfied.
   5. Issue Alarm if the unit has been in unoccupied mode for 4 hours (adj) and relative humidity rises above 60% (adj.). This time delay should allow false alarms immediately after units are disabled.

6. Manual Override: Control may be manually overridden at the zone Thermostat, controller and the COS.
7. Hardware Interlocks: Controls shall not bypass any safeties or interlocks associated with fire protection shutdown.

1.5 SPACE SETPOINTS

A. Temperature and humidity setpoints and operating schedules listed in sequences of operations are initial values, based upon input from Owner's representatives and common industry practice, and are not to be considered as final. Final setpoint and schedules must be programmed as per Owner's direction, and with approval of Owner and/or Engineer and Testing and Balancing firm, regardless of schedules listed in this specification.

B. In consultation with Owner and/or Engineer, and Testing and Balancing firm, make minor revisions to operating sequences which will result in improved operation of systems.

C. All adjustable setpoint temperature sensors / thermostats are to be set and software limited as to the range heating and cooling setpoint which building occupants may reset. Initial values are listed in control sequences. Determine final limits in consultation with Owner and Engineer.

D. Whether in Occupied or Unoccupied mode, the active heating setpoint must always be lower than the active cooling setpoint by a minimum of 5F, or higher if called for in sequences. This differential is referred to as the "deadband".
1. With exception of that required for dehumidification, no heating operation is to take place when room temperature is within deadband. Operation of hot water coil or electric reheat is to begin only when room temperature has fallen 1˚F below the heating setpoint.
2. Cooling operation within the deadband must be at an absolute minimum, ie. specified minimum air flow to provide necessary ventilation.

E. Room Temperature Setpoints
1. Allowable range for space temperature setpoints will be limited via control system.

    a. Program temperature setpoints to be set only at the central operator station, and not be adjustable at the zone thermostat.

2. System is expected to maintain room temperature no more than 0.75F above cooling setpoint / below heating setpoint during 'normal' steady-state operating conditions.
3. Unless otherwise noted in drawings or operating sequences described below, program the following room temperature setpoints for all heating and cooling equipment.

    a. Occupied Hours
        1) Cooling setpoint = 74F
        2) Heating setpoint = 69F

    b. Unoccupied Hours
        1) Cooling setpoint = 86F
        2) Heating setpoint = 59F
        3) Run unit for a minimum 20 minutes. Disable unit once temperature has fallen 3F below Cooling or 3F above heating setpoint.

F. Room Relative Humidity (RH) Setpoints
1. System is expected to begin dehumidification sequence when space RH reaches RH setpoint.
2. Unless otherwise noted in drawings or operating sequences described below, program the following room RH setpoints for all cooling equipment.

a. Occupied Hours
1) Cooling RH setpoint = 59%
2) Run unit for a minimum 5 minutes. Disable dehumidification mode once RH has fallen 3% below setpoint.

b. Unoccupied Hours
1) Cooling setpoint = 65%

G. Room CO2 Setpoints
1. Unless otherwise noted in drawings or operating sequences described below, program the following room CO2 setpoints for all HVAC equipment with CO2 control capability serving individual rooms where DCV is specified:

a. Occupied Hours
1) Minimum setpoint = 900ppm, corresponding to minimum OA intake. Coordinate with manufacturer to set this via the unit controller UI.
2) Maximum setpoint = 1100ppm, corresponding to maximum OA intake (equal to design OA CFM).
3) Program system so that min and max setpoints may be adjusted by system operator via Global Command.

b. Unoccupied Hours
1) Not applicable.

1.6 BACNET CONNECTIONS

A. NA

1.7 OUTDOOR AIR CONDITIONS

A. Outdoor air temperature and relative humidity are to be read from an Engineer-approved web-based weather service such as Accuweather.com. Update conditions at no longer than the minimum update time provided by national weather service.

B. Display OA temperature and RH conditions on all graphics screens. Display values rounded to nearest whole number.

1.8 GENERAL

A. Individual sequence descriptions may list units to which sequence applies. Contractor must verify equipment quantities and unit types through drawings review and on-site inspections.

B. All setpoints used in controls sequences shall be user adjustable with a minimum of keystrokes.

C. Points lists have been provided as a general guideline, and are not all inclusive. Provide all points required for achievement of operating sequences.

D. All delays shall be operator adjustable. Program for a minimum delay between on/off commands for HVAC equipment to prevent short cycling.

E. Unless noted otherwise, program for minimum VFD speed of 30% of full 60hz speed.

F. Unless noted otherwise, close HVAC unit outside air dampers during all Unoccupied periods.

G. Economizer Operation:
   1. For units with return air: During Occupied periods when system is in cooling mode, place unit in Economizer mode when:
      a. OA enthalpy is less than 23 Btu/lbm and equal or less than return air enthalpy; or
      b. OA dew point temperature is less than 54F and equal or less than dewpoint of return air enthalpy.
   2. For dedicated outside air units: During Occupied periods when system is in cooling mode, place unit in Economizer mode when:
      a. OA enthalpy is less than 23 Btu/lbm or OA air dew point temp is less than 54F.
   3. Economizer operation is to be based upon global OA values, as described in "OUTDOOR AIR CONDITIONS" above, and not on OA values measured directly at the unit, unless specifically noted otherwise.

H. Interlocks:
   1. Hardware: Controls shall not bypass any safeties or interlocks associated with fire protection shutdown.
   2. Provide all hardware necessary to achieve software interlocks required for proper system operation, including but not limited to control of dampers and exhaust fans. Coordinate with mechanical and electrical contractors.

I. AHUs:
   1. Coordinate with TAB to obtain RA and OA damper positions at different fan speeds. This will allow the AHUs to bring in the scheduled OA airflow as needed, irrespective of the AHU fan speed.

J. VFD:
   1. Speed displayed on BAS graphic must match the actual VFD speed. It is not permissible to display an output signal to the VFD, if the signal does not match actual VFD speed.

K. Operator Station Display: Indicate the following on operator workstation display terminal, as applicable per points list:
   1. Building floor plan, indicating individual rooms, temperature, RH, and CO2 sensor locations, and areas served by each air handler, fan coil unit and rooftop unit. Place sensor information strategically on the floor plan and draw in lines of zone separation on floor plan as required to make it unambiguously clear which sensor values apply to which room.
   2. Conditioned space air temperature, all zones.
   3. Conditioned space air Base temperature setpoint, all zones.
   4. Conditioned space air Effective temperature setpoint, all zones.

5. Distinguish different area(s) served by individual HVAC equipment items by use of color variation or heavy lines on floor plans graphics page.
6. When a control point is in “Test” or “Forced” mode, graphic shall clearly indicate this status by descriptive text, color change, or other similar means.

1.9 SUMMARY TABLES

A. Provide a dedicated graphic page for a summary table for each type of HVAC equipment for which there are two or more types (e.g. rooftop units, fan-coil units, etc.).
   1. Provide a master navigation button on main dashboard graphic page to take one to these tables.
   2. Provide tables using format and headers as in the following Sample tables:

DX RTU w/ Reheat Summary table

	1	2	3	4	5	6	7	8
RTU	Space Temp	Compr Stages On	Unit DAT	Space RH	Dehum Status	Ret Air CO2	OA Dmpr % open	Heat Status
RTU-126	74	1	54	54%	Off	750 (1)	44%	Off (2)

Exhaust Fans

Equipment	Space(s) Served	Command	Status	Fan Speed
EF-1	Art Rm 123	On (4)	On	Low (5)

Notes
(1) If no CO2 sensor exists, put "NA" in column.
(2) If SCR type, list %. If staged, list On or Off.
(3) If unit has no heat, put "NA" in column. If NO units in project have heat, omit column.
(4) List as On or Off, or as Enable or Disable, as appropriate.
(5) For all single speed fans, list "NA", list High or Low for 2-speed fans.

1.10 ALARMS

A. Alarms shall be read and displayed on graphics screens for conditions described in this section.
   1. The graphic screen for each piece of HVAC equipment must have a dedicated line for Alarm condition, and all alarms must be enunciated on the graphic screen when they occur.
   2. For CRITICAL alarms listed below, designated representatives of owner must be sent alarm messages **via text and email**. The alarm message must clearly indicate the campus, the particular piece of HVAC equipment for which alarm occurred, the date and time it occurred, and the nature of the alarm.
   3. All alarm setpoints are to be easily adjustable via operator interface. Controls provider will change all such setpoints, at Engineer’s direction, should actual conditions warrant different settings.
   4. All alarms are to be predicated on the equipment or system being ON and having been operational sufficient time to have stabilized. (E.g. when a chiller first starts in the

morning, it may take 30 minutes to achieve chilled supply water temperature setpoint; no alarms are to be initiated during that time.)

B. General Alarm requirements:

1. Alarms described below are for multiple types of HVAC and other systems. Program as applicable for equipment which exists on this project.
2. Except as otherwise noted below, no alarms are to be generated for equipment or sensors during Unoccupied hours.
3. All alarm setpoints are to be easily adjustable by Operator via global commands.
4. A delay (suggested 20 minutes) is to be incorporated before alarms are generated immediately following HVAC equipment startup in order to give equipment time to obtain desired conditions. If the programmed delay time proves inadequate to prevent nuisance alarms at equipment startup, Controls contractor must verify what delay time is appropriate, and whether such alarms are caused by mechanical issues.
5. Alarms are to be set up scrupulously to avoid generation of nuisance alarms, e.g. alarms read from HVAC units which repeatedly fail to start, generating a new alarm each time
6. ALARM DESCRIPTIONS MUST BE CLEARLY GIVEN IN HISTORICAL ALARMS REGISTER TO INDICATE THE NAME OF THE ITEM CAUSING THE ALARM. This description must be plainly displayed without the requirement of having to 'hover' the cursor over the alarm line in the alarm history register.
7. Where control system connects via Bacnet to a controller of an HVAC unit, in addition to simple on/off status of alarm, alarm codes are to be read and displayed by the BAS. Provide a dedicated graphic page to list description of alarm codes.

C. Critical HVAC Alarms:
1. Control system will send alarm notifications via text message and email to designated Owner personnel for Critical HVAC alarms for the following:
   a. When dedicated outside air coil leaving air temperature deviates from setpoint by 1.5F for 15 consecutive minutes.
   b. Any additional Critical HVAC alarms designated by engineer or owner's facility manager (FM).

D. CO2 alarms:
1. Register alarm any time, during occupied or unoccupied hours, that a sensor reads outside of the following Minimum / Maximum expected values indicating sensor is likely malfunctioning: 360 ppm / 1950 ppm.
2. Register alarm when any CO2 sensor (for examples, space or return duct) reads above 1300ppm for 15 consecutive minutes.
   a. Program system to all alarm setpoint to be adjustable via a Global Command.

E. Space temperature alarms:
1. Register alarm any time, during occupied or unoccupied hours, that a sensor reads outside of the following Minimum / Maximum expected values indicating sensor is likely malfunctioning: 45F / 100F.

F. Relative Humidity (RH) alarms:
1. Register alarm any time, during occupied or unoccupied hours, that a sensor reads outside of the following Minimum / Maximum expected values indicating sensor is likely malfunctioning: 10% / 100%.

G. For all HVAC units (including exhaust or ventilation fans), register alarms under the following conditions (where applicable to particular unit):
   1. Discrepancy between commanded state of operation and actual state of operation, as indicated by status feedback.
   2. Discharge air temperature of any hydronic cooling coil remains 1.5F above or 2F below setpoint for more than 15 consecutive minutes.
   3. Discharge air temperature of any DX cooling coil remains below 40F for more than 2 consecutive minutes.
   4. Discharge air temperature from an electric heating coil fails to rise by 5F within 15 minutes after heater is enabled.
   5. Outside air coil leaving air temperature remains below 35F for 5 consecutive minutes.
   6. Mixed air temperature remains below 35F for 5 consecutive minutes.
   7. Unit has tripped on any safety (e.g., high static pressure, freezestat).
   8. Duct static remains above 2.5" for 15 consecutive seconds; shut down air handler.
   9. Duct static pressure deviates above or below setpoint by 20% of setpoint for more than 15 minutes.

H. Register alarms for other equipment (e.g. refrigerant monitor, low or high static cutout switches, low temperature safety cutouts, etc.) when monitored alarm contacts close.

I. For all utility controllers, register alarms under the following conditions:
   1. System has been set to Purge mode.
   2. System remains in Purge mode for more than 30 consecutive minutes.
   3. Fan remains at high speed for more than 30 consecutive minutes.

J. Smoke Control: Smoke detector, where existing on HVAC units, stops fan when products of combustion are detected in air stream.
   1. Fan will be stopped directly via fire alarm system.
   2. BAS is not required to monitor smoke detector status.
   3. Stopping of fan by fire alarm system automatically signals alarm due to Command-Status mismatch at BAS.

K. **ALL** HVAC equipment items:
   1. Command/status mismatch for any component (e.g. fan, motor, heater, etc.)
   2. Safety alarms:
      a. Low mixed air temperature: < 35F for 2 minutes.
      b. High leaving air temperature: > 120F for 10 consecutive minutes.
      c. High duct static pressure, when measured analog:
         1) > 3.5" wc for 5 consecutive minutes.
         2) > 4.5" wc for 30 consecutive seconds.
      d. High duct static pressure, when via binary mechanical switch monitored by BAS: On/Off alarm status, set to trip at 3.5" wc.
      e. Safety alarms are to be programmed to shut down equipment.

L. ALL analog sensors (CO2, temperature, humidity, pressure, etc.):
   1. Sensor gives a reading outside of its normally expected range of:
      a. Space temperature, indoor conditions: 45F to 100F.
      b. Outdoor air conditions: 15F to 120F, 10% to 100%.
      c. Relative Humidity, indoor conditions: 15% to 80%.

d. CO2, indoor conditions: 375 to 1950 ppm. [sensors reading < 400ppm but within the submitted and specified accuracy (as an example, 40ppm ±2% of reading) must have an offset programmed such that they bottom out at no less than 400ppm]
e. Duct static pressure: -0.05" to 4.0".
f. Hydronic static or differential pressure: -1 to 100 psig.

2. Controlling air temperature sensors (e.g. can be space temp, return air temp, etc.):
   a. Measured temperature rises above or falls below setpoint by 2 deg F and remains so for 20 consecutive minutes. Base alarms only on active temperature setpoint, e.g. use Unoccupied setpoints for alarming when system is in Unoccupied mode.
   b. CRITICAL ALARM: Measured temperature rises above or falls below setpoint by 2 deg F and remains so for 1 hour.
3. HVAC unit air temperature sensors:
   a. DX cooling coil: leaving air temperature fails to fall to less than 58 deg F if compressor has been on for 15 consecutive minutes.
   b. DX heating coil: leaving air temperature fails to rise at least 10 deg F when heater has been on for 10 consecutive minutes.
   c. Heating coils (in AHU, VAV box, or elsewhere): leaving air temperature fails to rise at least 10 deg F when heater has been on for 10 consecutive minutes.
4. Relative humidity sensors:
   a. RH rises 10 percentage points above setpoint for 30 consecutive minutes.
5. Carbon Dioxide sensors:
   a. CO2 concentration rises above setpoint by 250ppm and remains so for 20 consecutive minutes.
6. Duct static sensor:
   a. Pressure deviates from setpoint (by 0.20") for more than 15 consecutive minutes.
7. Dirty filter dP sensor (when specified as a point):
   a. Coordinate with mechanical and TAB contractors to determine optimum dP setpoint. Alarm when dP surpasses setpoint for more than 3 consecutive hours.

M. Any equipment with BAS-BACnet communication specified (DX, VFD's, etc.):
1. Where equipment is provided with code numbers corresponding to alarm conditions, read and display the alarm code in the alarm indication line. Provide a dedicated page or table which explains the meaning of each code number.
2. Where equipment does not offer coded alarms, monitor general alarm contacts along with any other alarm conditions described herein and display alarm condition on graphic.

N. DOAS (dedicated outside air system) units: NA

O. VAV boxes (single duct air terminals):
1. Supply air Velocity Pressure falls to 0" wc or below for 15 consecutive minutes.
2. Supply air CFM deviates from setpoint by 15% or more for 15 consecutive minutes.
3. High (120F) or low (50F) leaving air temperatures are detected.
4. Damper for any VAV box remains at >95% open for more than 30 consecutive minutes
5. Cooling or Heating PID output signal is 100% for more than 3 consecutive hours.
6. VAV heat is on for more than 3 hours in any given day.
7. CRITICAL ALARM: Supply air CFM deviates from setpoint by 30% or more for 30 consecutive minutes.

P. Zone Dampers:
1. Damper remains at >95% open for more than 30 consecutive minutes.
2. Cooling or Heating PID output signal is 100% for more than 3 consecutive hours.

Q. Heat Recovery Wheels or Pipes: NA

R. For all utility controllers, register alarms under the following conditions: NA

1.11 GRAPHICS AND SOFTWARE UPDATES

A. For new Controllers, the Design Intent is to remove old Network Engines, and provide new Engine and Control Graphics with the latest UI graphics package.

B. Plans recreated from old drawings show locations of existing buildings and major HVAC equipment. Prior to providing quote, contractor shall perform site walkthroughs to get familiar with existing equipment, controls, locations of sensors, sequences, graphics, etc.

C. As part of the submittals process, provide a copy of the old graphics and controls points, with the new proposed graphics for engineer review. Contractor shall review existing graphics and update them. During submittal phase, Engineer will review submitted graphics and provide guidance. Allocate time for updating graphics as required.

1.12 SINGLE ZONE, CONSTANT AIR VOLUME, DX SPLIT SYSTEM

A. Field-verify applicability and adjust sequences as needed to match field conditions. Ensure that provided sequences are coordinated with equipment manufacturer, existing equipment and field conditions.

B. Coordinate with Div. 23, Section 238126- Split Systems. Units shall be configured as follows:
1. With APR valves for staging cooling during cooling and dehumidification modes
2. With CO2 based demand-controlled ventilation (DCV) using modulating, motorized, ultra-low leakage type, OA damper, and space CO2 sensors.

C. Fan Control: **System** cycles fan during unoccupied periods. During occupied hours, provide two distinct modes of fan operation that the Owner can select: **Continuous or Auto**.
1. Unless otherwise directed by Owner, initially set fan for Continuous operation.
2. Where applicable fan shall vary speed in coordination with compressor staging.

D. Unoccupied Mode Enable/Disable: During unoccupied hours, enable unit operation and control to meet unoccupied mode setpoints. Unit shall run until space conditions are satisfied, but never for more than 20 minutes in any hour.

E. Start-Up Operation: In the order of priority, start-up operation shall be commanded as follows:
1. System shall initiate unit and command to Cooling Mode if space temperature is above cooling setpoint.
2. System shall initiate unit and command to Heating Mode, if space temperature is below heating setpoint.
3. If temperature setpoint is satisfied at start-up, but humidity setpoint is not, System shall initiate unit in Dehumidification Mode.

F. Cooling Mode:
1. System stages compressors and via APR valve compressor capacity control, to maintain space air temperature setpoint.

2. Should space RH as measured by system surpass RH setpoint, activate dehumidification mode. Close outside air damper and disable cooling if space temperature drops 1.5F (adjustable) below space temperature heating set point.

G. Heating Mode (Electric Heat):
1. When space temperature drops below heating setpoint, **system** enables and stages electric heater in heating mode.

H. Ventilation (OA) Sequence:
1. Interlock OA dampers with compressors such that when system is in cooling mode, OA dampers will close when compressors cycle off.
2. Provide space CO2 sensors, and motorized OA dampers for DCV. Provide controls sequences to modulate OA dampers to maintain CO2 setpoint. Damper position, OA CFM and CO2 setpoint shall be operator adjustable.
3. Coordinate required minimum and maximum OA damper positions with TAB. Modulate OA dampers such that unit brings in desired OA intake at all fan speeds, i.e. OA damper will open more at low fan speed than at high fan speed.
4. TAB to document CFM and both minimum and maximum damper positions at minimum and maximum fan speed.
5. Unoccupied Periods:
   a. OA Damper Position: Closed.
6. Normal Operation:
   a. When CO2 Level is between minimum and maximum setpoints, modulate OA damper as follows:
      1) Minimum open position at minimum CO2 setpoint or less.
      2) Maximum open position at maximum CO2 setpoint (OA not to exceed scheduled CFM).
      3) Vary OA damper position linearly between minimum and maximum positions as CO2 varies between minimum and maximum values.
   b. When CO2 Level is below minimum setpoint, position OA damper to minimum open position, as determined by TAB for given fan speed (initially set at 25%).
   c. Close OA Damper if OA T drops below 35F or rises above 105F (adj. Setpoints.), or if space humidity rises more than 10% above set point (adjustable).

I. Graphics Display: Indicate the following on display terminal for every unit as applicable:
1. System graphic.
2. System occupied/unoccupied mode.
3. System on-off indication.
4. Fan status.
5. Fan speed.
6. System Heating / Cooling mode indication.
7. System Dehumidification mode indication, and APR valve status.
8. Cooling Stage 1 Compressor on-off indication.
9. Cooling Stage 2 Compressor on-off indication.
10. Electric heater status, each stage.
11. Unit discharge air temperature (downstream of heating coils).
12. Space-temperature.
13. Space-temperature setpoint.
14. Space relative humidity.
15. Space relative humidity setpoint.
16. CO2 concentration.

17. CO2 min and max setpoints.
18. OA damper commanded position.
19. OA damper position feedback.
20. Global outside air temperature and RH.
21. Outside air enthalpy.
22. BACnet pages for points, alarms, and alarm codes.

1.13 FCU SCHEDULED CONTROL SEQUENCES (DX FCU and ACCU)

A. Applicable to FCUs and associated ACCUs serving IDF room. Provide a dedicated BAS controller

B. Unit Default Mode:
1. Upon start-up, enable unit in cooling mode.

C. Cooling Sequences
1. Unit Start/Stop: 24/7 operation, unless Owner indicates otherwise.
2. Monitor unit status and space temperature.
3. Heating and Ventilation Modes: Not applicable.

D. Operator Workstation: Display the following data:
1. System graphic.
2. Unit commanded state.
3. Fan status (on/off).
4. Compressor Status (on/off).
5. Space Temperature.
6. Space Temperature Cooling setpoint.
7. Discharge Air Temperature.
8. Alarm

1.14 CONTROL SEQUENCES FOR DX RTUS

A. Design Intent:
1. New RTUs do not have hot gas reheat packages or motorized dampers.
2. BAS shall provide motorized dampers, T, RH, CO2 sensors in coordination with the equipment manufacturer, and as required to accomplish the sequences.
3. BAS shall control the new RTUs entirely, modulate compressors and fans to maintain space setpoints, reset setpoints (DAT, Space T, CO2), monitor OA/RA damper positions, alarms and parameters from the unitary controllers.

B. Ensure that provided sequences are coordinated with those specified in Div. 23, Section 237413- PACKAGED, OUTDOOR, CENTRAL-STATION AHUS– ELECTRIC HEAT. Control sequences shall be coordinated with the manufacturer. Configure units as follows:
1. With motorized OA and RA damper, and economizer modes.
2. With CO2 based demand-controlled ventilation (DCV) using modulating, motorized, ultra-low leakage type, OA damper, and space CO2 sensors.
3. Coordinate controls for compressors with manufacturer.

4. Prior to bidding, all parties (mechanical contractor, BAS contractor, equipment manufacturer / supplier) shall coordinate provision of sensors, engineering, interface, etc. for a smooth execution of the project.

C. Time Schedule: Program unit On and Off times as per Owner's instructions. Provide dedicated schedule for control of OA dampers.

D. Fan Control: **System** cycles fan during unoccupied periods. During occupied hours, provide two distinct modes of fan operation that the Owner can select: **Continuous or Auto**.
1. Unless otherwise directed by Owner, initially set fan for Auto operation.
2. Fan speeds shall be coordinated with compressor stages, per manufacturer's recommendations.
3. Modulate fan speed and compressor stages to maintain space T and RH setpoints,.

E. Unoccupied Mode Enable/Disable: During unoccupied hours, enable unit operation and control under the conditions listed below. Unit shall run until space conditions are satisfied, but never for more than 20 minutes in any hour.

F. Start-Up Operation: In the order of priority, start-up operation shall be commanded as follows:
1. System shall initiate unit and command to Cooling Mode if space temperature is above cooling setpoint.
2. System shall initiate unit and command to Heating Mode, if space temperature is below heating setpoint.
3. If temperature setpoint is satisfied at start-up, but humidity setpoint is not, System shall initiate unit in Dehumidification Mode. Coordinate with manufacturer.

G. Cooling Mode:
1. System cycles compressor stages to maintain space temperature setpoint.
2. Dehumidification mode: Stage compressors to maintain DAT setpoint of 52F (adj).
   a. Terminate Mode when RH drops below setpoint by deadband specified in SPACE SETPOINTS section above, or if system is commanded to Cooling Mode.
   b. See Div. 23 specifications for RTUs.

H. Heating Mode (Electric):
1. When space temperature drops below heating setpoint, stage heater to maintain space air temperature heating setpoint.
2. Terminate mode when space T rises above setpoint.

I. Economizer Mode:
1. When outside air (OA) conditions are appropriate for economizer operation, as described above in GENERAL / subparagraph "Economizer Operation", modulate dampers to maintain a mixed air / supply air temperature optimal for satisfying space temperature setpoint and minimizing or eliminating compressor operation.
2. Economizer operation is to be based upon a combination of return air temperature and outside air enthalpy, based upon global OA values, as described in "OUTDOOR AIR CONDITIONS" above, and not on OA values measured directly at the unit, unless specifically noted otherwise.
3. During Occupied periods when system is in cooling mode, place unit in Economizer mode when OA enthalpy is less than 23 Btu/lbm and equal or less than return air enthalpy; or OA dew point temperature is less than 54F and equal or less than dewpoint of return air enthalpy.

J. Ventilation (OA) Sequence:
   1. Provide CO2 sensors, and motorized OA dampers for DCV. Provide controls sequences to modulate OA dampers to maintain CO2 setpoint. Damper position, OA CFM and CO2 setpoint shall be operator adjustable, if possible.
   2. Coordinate required minimum and maximum OA damper positions with TAB. Modulate OA dampers such that unit brings in desired OA intake at all fan speeds, i.e. OA damper will open more at low fan speed than at high fan speed.
   3. TAB to document CFM and both minimum and maximum damper positions at minimum and maximum fan speed.
   4. Unoccupied Periods:
      a. OA Damper Position: Closed.
   5. Normal Operation:
      a. When CO2 Level is between minimum and maximum setpoints, modulate OA damper as follows:
         1) Minimum open position at minimum CO2 setpoint or less.
         2) Maximum open position at maximum CO2 setpoint (OA not to exceed scheduled CFM).
         3) Vary damper positions linearly between minimum and maximum positions as CO2 varies between minimum and maximum values.
      b. When CO2 Level is below minimum setpoint, position OA damper to minimum open position, as determined by TAB for given fan speed. (Prior to TAB determination of minimum open position values, system may be programmed for 8% open at high fan speed, 15% open at low fan speed.)
      c. Close OA Damper if OA T drops below 35F or rises above 105F (adj. Setpoints.), or if space humidity rises more than 10% above set point (adjustable).

K. Graphics Display: Indicate the following on display terminal for every unit as applicable:
   1. System graphic.
   2. System occupied/unoccupied mode.
   3. System on-off indication.
   4. Fan status.
   5. Fan speed command and indication.
   6. System Heating / Cooling mode indication.
   7. System Dehumidification mode indication.
   8. Cooling Coil leaving air temperature, setpoint and indication.
   9. Compressor / stages / speeds commanded position.
      a. Ensure that during dehumidification mode, BAS displays which compressor is ON.
   10. Electric heater status, each stage, or SCR %, as applicable.
   11. Unit discharge air temperature (downstream of heating coils).
   12. Space-temperature.
   13. Space-temperature setpoint.
   14. Space relative humidity.
   15. Space relative humidity setpoint.
   16. Space CO2 concentration.
   17. Space CO2 min and max setpoints.
   18. OA and RA damper commanded position.
   19. OA and RA damper position feedback.
   20. Global outside air temperature and RH.
   21. Outside air enthalpy and economizer status.

L. Safeties:

1. Smoke Control with smoke detector located in return air.
2. High temperature safety.
3. Freeze-stat safety.

1.15 VARIABLE VOLUME, HYDRONIC AIR-HANDLING UNITS WITH ZONE DAMPERS

A. Design Intent: Existing electric duct heater, zone dampers in the air distribution system will be retained and reused. Controls for zone dampers will also be retained and reused. Provide all new controls for the AHUs.

B. Time Schedule:
1. Program On and Off times as Owner's instructions.

C. Fan Operation:
1. Unoccupied periods: Cycle fan to maintain unoccupied period setback temperature.
2. System starts fan to run continuously during occupied periods.
3. Modulate fan speed between minimum speed (adj.) and 100% to maintain duct static pressure setpoint. Sensor shall be installed at a location close to the end of the ducting system (field coordinate with Engineer).
4. Upon high static reading (above 2.5", adjustable), system shall issue an alarm at the Central Operator's Station and shut down air handler and outside air unit.

D. Cooling Mode:
1. During start-up, unit will be enabled in cooling mode if two monitored zone temperatures are above cooling setpoint.
2. System modulates fan VFD to maintain duct static pressure setpoint.
3. Modulate CHW valve to maintain discharge air temperature setpoint (53F, adj.)

E. Reset of AHU Discharge Air Temperature Setpoints
1. Reset AHU DAT to maintain space temperature and relative humidity setpoint conditions in the most energy efficient manner possible. Program a cascading sequence as follows:
   a. If the critical zone damper system (hottest zone) PID output less than 90% open, reset DAT higher gradually (by modulating heaters) up to 65F (adj). Most critical zone damper system should be fully open.
   b. If zone temperature in any space rises above setpoint, reset DAT lower gradually to the normal setpoint.
   c. As cooling loads increase, reverse the above setpoint reset sequence.
   d. If return air RH rises to greater than setpoint (60%, adj) for 20 minutes, open CHW Coil valve to maintain DAT of 50F. Disable dehumidification mode when RH setpoint is achieved.

F. Heating Mode (Electric): Heaters are at the discharge of AHUs.
1. When all zones are below heating setpoint, and return air RH is at or below setpoint, stage heater to maintain a discharge air temperature setpoint of 85F (adj). Zone damper systems shall modulate to maintain space T setpoints.

G. Ventilation Sequence
1. During unoccupied mode, OA damper shall remain closed.

2. Coordinate with TAB to obtain RA and OA damper positions at different fan speeds. This will allow the AHUs to bring in the scheduled OA airflow as needed, irrespective of the AHU fan speed.
3. Dampers shall not be hardwired to open and close when units are enabled/disabled.
4. Associated exhaust fans shall be disabled and outside air dampers shall remain closed during unoccupied hours -including cool-down and nighttime reset operation.
5. Provide dedicated time schedule for OA dampers and exhaust fans that *can be* set independently of AHU time schedule. Obtain actual Occupancy schedule from Owner and open / close outside air damper per Owner's actual Occupancy schedule (and **not per AHU schedule**).
6. Dampers shall modulate between minimum open and maximum scheduled (fully) open position to maintain return air CO2 setpoint of 1100 ppm (adj.).
7. Minimum damper position is determined by TAB Contractor such that building remains positively pressurized when building exhaust fans are on.
8. Open outside air damper fully when return air CO2 concentration exceeds low CO2 setpoint of 1100 ppm (adj).
    a. If after 30 minutes of operation CO2 concentration has not fallen below 900 ppm, modulate return air damper 20% closed.
    b. If after an additional 30 minutes of operation CO2 concentration has not fallen below 900 ppm, modulate return air damper 40% closed, and continue operation at that position until CO2 concentration has fallen below 900 ppm.
    c. Modulate outside air dampers to minimum position when CO2 concentration falls to 900 ppm or lower; re-position return air dampers to fully open.
    d. If CO2 concentration exceeds 1,400 ppm, or OA flow drops below minimum, system shall issue an alarm at the Central Operator's Station.

H. Exhaust fan interlocks: Coordinate software interlocks between exhaust fans and outside air dampers. Refer to schedules and plans for exhaust fan allocation to units. Coordinate with Engineer.

I. Operator Station Display: Indicate the following on operator workstation display terminal (if applicable) per each unit:
1. System occupied/unoccupied mode.
2. A clear description of what area or room(s) unit serves.
3. Outside-air-temperature indication.
4. Outside-air-RH indication.
5. Fan commanded state.
6. Fan status (ON/OFF)
7. VFD Speed command and speed feedback
8. Duct static pressure setpoint.
9. Duct static pressure.
10. Cooling control-valve commanded position
11. Discharge air temperature setpoint and indication (downstream of cooling coils).
12. Heater staging (SCR), % output for SCR controls.
13. Discharge air temperature setpoint and indication (downstream of heater).
14. Return air temperature from space, upstream of coil.
15. Return air CO2 concentration.
16. Return air relative humidity.
17. Return air damper commanded position.
18. Return air damper position feedback.
19. Outside air damper commanded position.

20. Outside air damper position feedback.
21. Critical Zone damper system identification, temperature, and damper position.
22. Provide a Summary Page graphic screen for summarizing conditions of all associated zones damper systems, showing the following information: Zone name, Space Temperature, Damper position.

J. Safeties:
1. Smoke Control: Smoke detector, located in return air, stops fan when products of combustion are detected in air stream. Stopping of fan automatically signals alarm.
2. Freeze protection: When OAT drops below 34F (adj), close OAD, open OA section CHW valve to 50%.
3. High static pressure safety.
4. Freeze-stat safety.
5. High temperature safety.

1.16 ZONE LEVEL CONTROLS

A. Applicable to: World Scholar Building

B. Design Intent: Provide sequences, temperature sensors, duct static pressure sensors, zone dampers, bypass dampers, and operators, and all required controls for a complete and operational system. Coordinate with mechanical contractor for installation and with TAB. Controls for the AHU shall be retained and reused.

C. Provide a Summary Page graphic screen for summarizing conditions of all associated zone and bypass dampers, showing the following information: Damper name, damper position, space temperature and setpoint.

D. Zone Dampers without heat.
1. Provide heating and cooling temperature setpoints with a 5˚F deadband, min.
2. Allowable adjustable range settings shall be programmable only at the COS (and not at the zone thermostat).
3. Room sensor reports temperature. Modulate damper to maintain temperature set point.
4. When room temperature is below cooling setpoint, damper shall be in minimum position (30% adj. minimum, for proper ventilation).
5. As room temperature drops below heating setpoint, the following “energy conservation” resets shall be implemented, before the electric heat is activated. See AHU sequences.
   a. Normal AHU DAT setpoint will be gradually increased, provided none of the zone dampers are calling for cooling.
   b. Eventually, AHU electric reheat will be used. Damper shall reverse operation when AHU is in heating mode, and DAT is higher than 74F (adj).
6. Open damper to 100% when associated AHU is Off.
7. Operator Workstation: Display the following data:
   a. Room(s) served.
   b. Name of room (e.g., Science Lab 104; etc.).
   c. Room temperature
   d. Room Base temperature cooling and heating set points
   e. Room Effective cooling and heating set points
   f. Air-damper position as percent open, each damper for that zone.
   g. AHU DAT.

E. Bypass damper: Replace existing bypass damper, and damper-actuator, and duct static pressure sensor. Retain and reuse existing AHU sequences and duct static pressure setpoints.

1.17 OTHER SEQUENCES

A. Operator Overrides: System shall allow operator to enable / disable unit and / or control / adjust all setpoints from COS.

B. Graphics pages must have units listed beside parameter values (e.g. ˚F, ppm, % Open, psi, etc.)

C. When parameters are in manual or test modes, graphics shall indicate that they are in test mode.

D. Provide up to 8 hours of programming to account for additional control sequences and fine-tuning above sequences, during the project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Chilled-water piping.
   2. Condensate-drain piping.
   3. Air-vent piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Fittings.
   2. Piping.

B. Sustainability Submittals:

   1. Product Data: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

C. Delegated-Design Submittal:

   1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
   2. Locations of pipe anchors and alignment guides and expansion joints and loops.
   3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
   4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

   1. Suspended ceiling components.
   2. Other building services.
   3. Structural members.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
1. Chilled-Water Piping: 175 psig at 200 deg F.
2. Makeup-Water Piping: 80 psig at 150 deg F.
3. Condensate-Drain Piping: 150 deg F.
4. Air-Vent Piping: 200 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

D. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

E. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Grooved Mechanical-Joint Fittings and Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International.
b. Central Sprinkler Company.
c. Victaulic Company.

2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

3. Couplings: Ductile- or malleable-iron housing and EPDM gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Charlotte Pipe and Foundry Company.
   b. Viega LLC.

2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Charlotte Pipe and Foundry Company.
   b. NIBCO INC.

2. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Watts; a Watts Water Technologies company.
   b. Wilkins.
   c. Zurn Industries, LLC.

2. Description:

   a. Standard: ASSE 1079.

b. Pressure Rating: 250 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Watts; a Watts Water Technologies company.
b. Wilkins.
c. Zurn Industries, LLC.

2. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 175 psig.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Central Plastics Company.
c. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Grinnell Mechanical Products.
b. Victaulic Company.

2. Description:

a. Standard: IAPMO PS 66.
b. Electroplated steel nipple, complying with ASTM F 1545.
c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.

e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be the following:
1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Makeup-water piping installed aboveground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

E. Condensate-Drain Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

F. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

G. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Div. 23 sections.

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet.
2. NPS 1: Maximum span, 7 feet.
3. NPS 1-1/2: Maximum span, 9 feet.
4. NPS 2: Maximum span, 10 feet.
5. NPS 2-1/2: Maximum span, 11 feet.
6. NPS 3 and Larger: Maximum span, 12 feet.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes special-duty valves and specialties for the following:
   1. Chilled-water piping.
   2. Air-vent piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
   2. Air-control devices.
   3. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Chilled-Water Piping: 175 psig at 200 deg F.
   2. Makeup-Water Piping: 80 psig at 150 deg F.
   3. Air-Vent Piping: 200 deg F.
   4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Sections.

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900.

C. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong Pumps, Inc.
      b. Bell & Gossett; a Xylem brand.
      c. Flow Design, Inc.
      d. Griswold Controls.
      e. Grundfos
      f. Nexus Valve, Inc.
      g. Taco.

   2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
   3. Ball: Stainless steel.
   4. Stem Seals: EPDM O-rings.
   5. Disc: Glass and carbon-filled PTFE.
   6. Seat: PTFE.
   7. End Connections: Flanged or grooved.
   8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
   9. Handle Style: Lever, with memory stop to retain set position.
   10. CWP Rating: Minimum 125 psig.
   11. Maximum Operating Temperature: 250 deg F.

D. Automatic Flow-Control Valves:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Flow Design, Inc.

b. Griswold Controls.
c. Grundfos
d. Nexus Valve, Inc.

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. Grundfos
   e. Nexus Valve, Inc.
   f. Taco, Inc.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. Grundfos
   e. Nexus Valve, Inc.
   f. Taco, Inc.

2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2.

6. Discharge Connection: NPS 1/4.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 240 deg F.

C. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. Grundfos
   e. Taco, Inc.

2. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
3. Maximum Working Pressure: 150 psig.
4. Maximum Operating Temperature: 250 deg F.

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 40-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

D. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

E. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping." Section 15124 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION 232116

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty.

1. Include pressure drop, based on manufacturer's test data, for the following:

a. Thermostatic expansion valves.
b. Solenoid valves.
c. Hot-gas bypass valves.
d. Filter dryers.
e. Strainers.
f. Pressure-regulating valves.

B. Shop Drawings:

1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
3. Show interface and spatial relationships between piping and equipment.
4. Shop Drawing Scale: 1/4 inch equals 1 foot.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:

1. Suction Lines for Air-Conditioning Applications: 115 psig.
2. Suction Lines for Heat-Pump Applications: 225 psig.
3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-407C:

1. Suction Lines for Air-Conditioning Applications: 230 psig.
2. Suction Lines for Heat-Pump Applications: 380 psig.
3. Hot-Gas and Liquid Lines: 380 psig.

C. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8/A5.8M.

E. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.

3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with AHRI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24-V ac coil.
7. End Connections: Socket.
8. Throttling Range: Maximum 5 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.

5. Maximum Operating Temperature: 275 deg F.

J. Moisture/Liquid Indicators:
1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in parts per million (ppm).
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

K. Permanent Filter Dryers: Comply with AHRI 730.
1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina, charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

L. Receivers: Comply with AHRI 495.

1. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

M. Liquid Accumulators: Comply with AHRI 495.
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arkema Inc.
2. DuPont Fluorochemicals Div.
3. Genetron Refrigerants; Honeywell International Inc.
4. Mexichem Fluor Inc.

B. ASHRAE 34, R-134a: Tetrafluoroethane.

C. ASHRAE 34, R-407C: Difluoromethane/Pentafluoroethane/1,1,1,2-Tetrafluoroethane.

D. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

2.5 REFRIGERANT PIPING SUPPORT EXTERIOR TO BUILDING

A. Exterior: Pre-manufactured strut supports; 3/8” stainless steel threaded rods holding 7” long aluminum cross-strut, stainless steel bolts, 3” to 6” adjustable height, molded 33% fiberglass reinforced nylon support base; UV stabilized. MAPA Products, type MS-2 or MS-3.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

D. Safety-Relief-Valve Discharge Piping: Schedule 40, black-steel and wrought-steel fittings with welded joints.

E. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12M/D10.12.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 232513 - WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following water treatment for closed-loop hydronic systems:

B. Contractor shall contract with Owner's water treatment Contractor (Nalco).

C. Chemical treatment contractor shall reuse existing chemical treatment equipment, and provide chemical treatment such that specified water conditioning is achieved. Provide a dye in the hydronic piping system.

1.3 DEFINITIONS

A. TSS: Total suspended solids are solid materials, including organic and inorganic, that are suspended in the water. These solids may include silt, plankton, and industrial wastes.

1.4 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
   1. Chemical material safety data sheets.

1.5 INFORMATIONAL SUBMITTALS

A. Water Analysis Provider Qualifications: Verification of experience and capability of HVAC water-treatment service provider.

B. Field quality-control reports.

C. Other Informational Submittals:

   1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in "Performance Requirements" Article.
   2. Water Analysis: Illustrate water quality available at Project site.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Contractor shall have a local office within 75 miles of the project site.

1.8 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion and scale formation for hydronic piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
3. Periodic field service and consultation.
4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Chemicals: Furnish quantity equal to 100 percent of amount initially installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Nalco; an Ecolab company.
2. Or Owner pre-approved company.

2.2 PERFORMANCE REQUIREMENTS

A. Water quality for hydronic systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of hydronic equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, hydronic system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including chilled water, shall have the following water qualities:
1. Meet state and local pollution standards, codes and regulations.
2. pH: Maintain a value within 9.0 to 10.5.
3. TSS: Maintain a maximum value of 10 ppm.
4. Hardness: 0.0
5. Iron: 0.0
6. TDS: 1500 to 1700 PPM (as CaCO3)
7. Silica: 60 PPM or less
8. Copper: Per manufacturer's recommendations.
9. Total Algae: 0.00 growth.
10. Provide liquid biocide during initial fill.
11. Microbiological Limits:

    a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/mL.
    b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/mL.
    c. Nitrate Reducers: Maintain a maximum value of 100 organisms/mL.
    d. Sulfate Reducers: Maintain a maximum value of zero organisms/mL.
    e. Iron Bacteria: Maintain a maximum value of zero organisms/mL.

2.3 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: 5 gal..
2. Minimum Working Pressure: 175 psig.

2.4 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment and that can attain water quality specified in "Performance Requirements" Article.

B. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

C. Biocide: Chlorine release agents or microbiocides.

D. Closed-Loop, Water Piping Chemicals: Sequestering agent to reduce deposits and adjust pH, corrosion inhibitors, and conductivity enhancers.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water testing equipment on wall near water chemical application equipment.

C. Bypass Feeders: Install in closed hydronic systems, including chilled water, and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps unless otherwise indicated on Drawings.
2. Install water meter in makeup-water supply.
3. Install test-coupon assembly in bypass circuit around circulating pumps unless otherwise indicated on Drawings.
4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below the feeder inlet.
5. Install a swing check on the inlet after the isolation valve.

3.3 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance.

B. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Comply with requirements in Section 232116 "Hydronic Piping Specialties."

C. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Sections.

D. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers required in makeup-water connections to potable-water systems.

E. Confirm applicable electrical requirements in electrical Sections for connecting electrical equipment.

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. At eight-week interval following Substantial Completion, perform separate water analyses on hydronic systems to show that chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to "Performance Requirements" Article.

E. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Acidity and Alkalinity: ASTM D 1067.
3. Iron: ASTM D 1068.
4. Water Hardness: ASTM D 1126.

3.5 ADJUSTING

A. Occupancy Adjustments: Within 12 months of Substantial Completion, perform two separate water analyses to prove that systems are maintaining water quality within performance

requirements specified in this Section. Perform analyses at least 60 days apart. Submit written reports of water analysis.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

END OF SECTION 232513

SECTION 232923 - VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. **INSTALLATION OF VFD THAT HAS BEEN PRE-PURCHASED BY OWNER.**
2. **EQUIPMENT SUBMITTALS HAVE BEEN PROVIDED FOR CONTRACTOR'S INFORMATION.**
3. **CONTRACTOR SHALL COMPLY FULLY WITH SPECIFICATIONS SECTION PART 1 - GENERAL, AND PART 3 - EXECUTION.**
4. **COORDINATE WITH SUPPLIERS FOR EXACT BOM. PROVIDE ALL ACCESSORIES THAT ARE SPECIFIED AND REQUIRED, AND THAT HAVE BEEN EXCLUDED BY THE SUPPLIER.**

B. This Section includes solid-state, PWM, VFDs for speed control of three-phase, squirrel-cage induction motors.

C. Related Sections include the following:
1. Division 26 Section "Electrical Power Monitoring and Control" for monitoring and control of motor circuits.
2. Division 26 Section "Transient Voltage Suppression" for low-voltage power, control, and communication surge suppressors.

1.3 DEFINITIONS

A. BAS: Building Automation System.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFD: Variable frequency drive.

1.4 REFERENCES

A. ANSI/NEMA ICS 6 – Enclosures for industrial control systems.

B. ANSI/UL 198C – High intensity capacity fuses; current limiting types.

C. NEMA ICS 2 – Industrial control devices, controllers, and assemblies.

D. NEMA KS 1 – Enclosed switches.

E. NEMA PB 1.1 – Instructions for safe installation, operation, and maintenance of panelboards rated 600 volts or less.

1.5 SUBMITTALS

A. Product Data: For each type of VFD, provide dimensions; mounting arrangements; location for conduit entries; shipping and operating weights; and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.

B. Shop Drawings: For each VFD.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Each installed unit's type and details.
      b. Nameplate legends.
      c. Short-circuit current ratings of integrated unit.

   2. Wiring Diagrams: Power, signal, and control wiring for VFD. Provide schematic wiring diagram for each type of VFD.

C. Manufacturer's field service report.

D. Operation and Maintenance Data: For VFDs, all installed devices, and components to include in emergency, operation, and maintenance manuals. Include routine maintenance requirements for VFDs and all installed components

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain VFDs of a single type through one source from a single manufacturer.

B. 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.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, minimum clearances between VFDs, and adjacent surfaces and other items. Comply with indicated dimensions and clearances.

D. Comply with NFPA 70.

E. UL listed drive and UL-508 listed bypass/inverter assembly.

1.7 COORDINATION

A. Coordinate size, location, and installation of equipment.

B. Coordinate loose parts shipped by the supplier.

C. Coordinate with supplier for installation instructions and details.

D. Coordinate field provided services such as startup, and warranty included in the original purchase order of the equipment.

1.8 WARRANTY

A. The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Special Warranty: Equipment manufacturer will provide warranty documentation per the pre-purchase agreement.

C. Contractor shall provide the installation and labor warranty for a period of 1 year after substantial completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Coordinate with Owner and equipment supplier the location of storage.

B. Contractor shall cooperate fully with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

C. Contractor, Owner's representative, and Manufacturer's representative shall inspect equipment to verify condition. Contractor, Owner's representative, and Manufacturer's representative shall note, in writing, any visible defects or damage to units. Contractor shall take possession of equipment for installation only if the units are accepted to be in good condition.

D. Contractor is responsible for equipment relocation process from storage facility to the site. Cooperate completely with supplier and Owner.

1.10 SPARE PARTS

A. Spare Fuses: Furnish three spare fuses for each type and rating installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See attached submittals.

2.2 VARIABLE FREQUENCY DRIVES

A. See attached submittals.

2.3 ENCLOSURES

A. NEMA 4XSS for any VFD located outdoors.

B. NEMA 12, for all other VFDs located in unconditioned space (indoors).

C. NEMA 1, for all other VFDs located in conditioned space (indoors).

D. Metal inverter enclosure. Plastic and/or fiberglass enclosures are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION, DELIVERY, AND STORAGE

A. Contractor shall coordinate with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

B. Installation of equipment is sole responsibility of Contractor. Supplier will offer assistance according to standard practice and as required by these specifications.

C. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible.

D. Cover Products with impervious sheet covering. Provide ventilation to avoid condensation.

E. Arrange storage of Products to permit access for inspection.

3.2 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATIONS

A. Select features of each VFD to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, drive, and load.

B. Select rating of controllers to suit motor controlled.

3.4 INSTALLATION

A. Anchor each VFD assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with VFD mounting surface.

B. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 16 Section "Fuses."

C. Do not install incoming AC lines in same conduit as feeder lines to motor.

D. Do not install wiring runs between VFD and motor longer than recommended by manufacturer.

3.5 IDENTIFICATION

A. Identify VFDs, components, and control wiring according to Division 16 Section "Basic Electrical Materials and Methods"

3.6 CONNECTIONS

A. Ground equipment.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.7 FIELD QUALITY CONTROL

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Prepare for acceptance tests as follows:
1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Testing: Perform the following field quality-control testing:
1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

3.8 STARTUP SERVICE

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Inspect field-assembled components and equipment installation, including pretesting and adjusting VFDs, and perform startup service.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

D. Complete installation and startup checks according to manufacturer's written instructions.

E. Upon successful completion of testing, submit written certification that drives are operating in accordance with Contract Documents, and within design operating limits of equipment. Notify Owner; include set points of adjustable devices, amperages recorded, and any other pertinent data. This information is to be included in the operation and maintenance manual.

3.9 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.10 CLEANING

A. Clean VFDs internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.11 DEMONSTRATION

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Provide services of manufacturer trained employee(s) for minimum of three hours training. Demonstrate operation of controllers in the automatic, manual, and bypass modes.

END OF SECTION 232923

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Single-wall rectangular ducts and fittings.
   2. Single-wall, spiral-seam, round ducts and fittings.
   3. Double-wall, round and flat-oval spiral-seam ducts and formed fittings.
   4. Sheet metal materials.
   5. Duct liner.
   6. Sealants and gaskets.
   7. Hangers and supports.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
   2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.
   3. Fire-Stopping Materials.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:
   1. Sheet metal thicknesses.
   2. Joint and seam construction and sealing.
   3. Reinforcement details and spacing.
   4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
   2. Suspended ceiling components.
   3. Structural members to which duct will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Penetrations of smoke barriers and fire-rated construction.
   6. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. Round, Spiral Lock-Seam Ducts.

B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
   1. Manufacturers:
      a. Lindab Inc.
      b. McGill AirFlow LLC.
      c. SEMCO Incorporated.
      d. Sheet Metal Connectors, Inc.
      e. Spiral Manufacturing Co., Inc.

C. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

D. Duct Joints:
   1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
   2. Ducts 21 to 72 Inchesin Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
   3. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
      a. Manufacturers:
         1) Ductmate Industries, Inc.
         2) Lindab Inc.

E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Unless elbow construction type is indicated, fabricate elbows as follows:
   1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
   2. Round Mitered Elbows with Aerofoil Vanes: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
      a. Ducts 3 to 36 Inches in Diameter: 0.034 inch.
      b. Ducts 37 to 50 Inches in Diameter: 0.040 inch.

   3. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
   4. Round Elbows 8 Inchesand Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
   5. Round Elbows 9 through 14 Inchesin Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate

nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

6. Round Elbows Larger than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
7. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.
8. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
9. Pleated Elbows for Sizes through 14 Inches in Diameter and Pressures through 10-Inch wg: 0.022 inch.

2.3 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Lindab Inc.
   2. McGill AirFlow LLC.
   3. SEMCO Incorporated.

B. Ducts: Prefabricated double-wall (insulated) ducts with an outer shell and an inner duct. Dimensions indicated are for inner ducts.

C. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

D. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
   1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
      a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

   2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

   3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Inner Duct: Minimum 0.028-inch solid sheet steel.

F. Fittings: Fabricate double-wall (insulated) fittings with an outer shell and an inner duct.
   1. Solid Inner Ducts: Use the following sheet metal thicknesses:

a. Ducts 3 to 34 Inches in Diameter: 0.028 inch.
b. Ducts 35 to 58 Inches in Diameter: 0.034 inch.
c. Ducts 60 to 88 Inches in Diameter: 0.040 inch.

G. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Maximum Thermal Conductivity: 0.26 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Terminate insulation where double-wall duct connects to single-wall externally insulated duct, and reduce outer shell diameter to inner duct diameter.
4. Coat insulation with antimicrobial coating.
5. Cover insulation with polyester film complying with UL 181, Class 1.
6. Supply and Make-Up Air Ducts: **2 inches** thick.
7. **Painted for indoor application.** Coordinate final finish with architect.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Manufacturers:
a. Owens Corning’s Aeroflex Plus Duct Liner or Equal.

2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.
   a. Maximum Thermal Conductivity:
   b. Thickness: 1 inch for sound attenuation, and R8 for thermal insulation.
   c. Thermal Conductivity (k-Value): 0.26 at 75 deg Fmean temperature.
   d. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84.
   e. Water-Based Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   f. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      1) Tensile Strength: Indefinitely sustain a 50-lb-tensile, dead-load test perpendicular to duct wall.
      2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
   2. Tape Width: 4 inches.
   3. Sealant: Modified styrene acrylic.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   7. Service: Indoor and outdoor.
   8. Service Temperature: Minus 40 to plus 200 deg F.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
   10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.8 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant, one-part elastomeric sealant, formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Products: Subject to compliance with requirements, products that may be incorporated in the Work are limited to, the following:
1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
2. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
3. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.

C. Seams and laps arranged on top of duct.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   1. Fan discharges.
   2. Intervals of lined duct preceding unlined duct.
   3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm or where indicated.

I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", and as defined below.
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. All Ducts U.N.O: Seal Class A.
   3. Unconditioned Space, Return-Air Ducts: Seal Class B.
   4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 Sections.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:
   1. **Comply with requirements for Leakage Class A for sealing all ducts.** Refer to SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
   2. Test the following systems:
      a. Supply, Return, Exhaust, Outdoor Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
      b. Engineer will randomly designate two supply duct systems for testing in accordance with Section 4 of SMACNA HVAC Air Duct Leakage Test Manual, current edition. If leakage test results exceed SMACNA allowable leakage rates, then additional two systems shall be tested. Supply duct test section shall include main trunk line from the mechanical room to the farthest VAV box. For systems without VAV boxes, main trunk shall be determined on site

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:
1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

A. Supply Ducts:
1. Ducts Connected to Fan Coil Units, and Terminal Units:
   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: A
2. Ducts Connected to Constant-Volume Air-Handling Units
   a. Pressure Class: Positive 3-inch wg
   b. Minimum SMACNA Seal Class: A
3. Ducts Connected to Variable-Air-Volume Air-Handling Units:
   a. Pressure Class: Positive 4-inch wg.
   b. Minimum SMACNA Seal Class: A

B. Return Ducts:
1. Ducts Connected to Fan Coil Units, and Terminal Units
   a. Pressure Class: Positive or negative 2-inch wg
   b. Minimum SMACNA Seal Class: B.
2. Ducts Connected to Air-Handling Units
   a. Pressure Class: Positive or negative 3-inch wg
   b. Minimum SMACNA Seal Class: B

C. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg
      b. Minimum SMACNA Seal Class: A

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
   1. Ducts Connected to AHUs, Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units
      a. Pressure Class: Positive or negative 2-inch wg
      b. Minimum SMACNA Seal Class: A

E. Double-Wall Duct Interstitial Insulation:
   1. Supply Air Ducts: 2 inches thick, unless noted otherwise on drawings.

F. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
      a. Double Skin vaned elbows. See drawings.
   2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Radius-to Diameter Ratio: 1.5.
      b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
      c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: Spin in.
   2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
      a. Velocity 1000 fpm or Lower: 90-degree tap.
      b. Velocity 1000 to 1500 fpm: Conical tap.
      c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Backdraft and pressure relief dampers.
   2. Barometric relief dampers.
   3. Manual volume dampers.
   4. Control dampers.
   5. Fire dampers.
   6. Flange connectors.
   7. Turning vanes.
   8. Remote damper operators.
   9. Duct-mounted access doors.
   10. Flexible connectors.
   11. Flexible ducts.
   12. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

      a. Special fittings.
      b. Manual volume damper installations.
      c. Control-damper installations.
      d. Fire-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
      e. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

1.7 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G90.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. Description: Gravity balanced. Blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner, steel ball bearings, and axles.

C. Frame: Hat-shaped, 0.05-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

D. Blades: Multiple single-piece blades, 0.050-inch-thick aluminum sheet with sealed edges.

E. Blade Action: Parallel.

F. Blade Seals: Neoprene, mechanically locked.

G. Blade Axles:
1. Material: Galvanized steel.

H. Tie Bars and Brackets: Galvanized steel.

I. Return Spring: Adjustable tension.

J. Accessories:
1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators, where noted.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Stainless steel.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flexmaster U.S.A., Inc.
    b. McGill AirFlow LLC.
    c. Nailor Industries Inc.
    d. Pottorff.
    e. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Pottorff.
    d. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.

e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.

6. Blade Axles: Galvanized steel.
7. Tie Bars and Brackets: Aluminum.

C. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pottorff.
b. Ruskin Company.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:

a. Hat shaped.
b. 0.094-inch-thick, galvanized sheet steel.
c. Mitered and welded corners.
d. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized, roll-formed steel, 0.064 inch thick.

7. Blade Axles: Galvanized steel.
8. Blade Seals: Neoprene.
9. Tie Bars and Brackets: Galvanized steel.
10. Accessories:

a. Include locking device to hold single-blade dampers in a fixed position without vibration.

D. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pottorff.
b. Ruskin Company.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.

5. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
    d. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.

7. Blade Axles: Galvanized steel.
8. Blade Seals: Neoprene.
9. Tie Bars and Brackets: Aluminum.
10. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

E. Jackshaft:
1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.
4. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:
1. Hat shaped.
2. 0.094-inch-thick, galvanized sheet steel.
3. Mitered and welded corners.

D. Blades:
1. Multiple blade with maximum blade width of 6 inches.

2. Opposed-blade design.
3. Galvanized-steel.
4. 0.064 inch thick single skin.
5. Blade Edging: Closed-cell neoprene.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:
1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.7 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ.
3. Ward Industries, Inc.

B. Description: Factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. METALAIRE, Inc.
3. SEMCO Incorporated.
4. Ward Industries, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

2.9 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff.
2. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Cover-Plate Material: Stainless steel.

2.10 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. Greenheck Fan Corporation.
3. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

2.11 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ward Industries, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd..

2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
1. Minimum Weight: 16 oz./sq. yd..
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
1. Minimum Weight: 14 oz./sq. yd..
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

2.12 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Flexmaster U.S.A., Inc.
2. Thermaflex

A. Where acoustical flexible duct is shown on drawings, provide Flexmaster Type 8M (or Thermaflex M-KE) UL 181 Class I Air Duct or equal.

B. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.

C. The internal working pressure rating shall be at least 6” w.g. positive and 4” w.g. negative through 16” diameter, and 1” w.g. negative for 18” and 20” diameters, with a bursting pressure of at least 2 ½ time the working pressure.

D. The duct shall be rated for a velocity of at lease 4000 feet per minute.

E. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

F. Factory insulate the flexible duct with fiberglass insulation. The R-value shall be at least 8 at a mean temperature of 75° F.

G. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure.

H. Sound attenuation Properties: Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council’s Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

Octave Band	**2**	**3**	**4**	**5**	**6**	**7**
Hz.	125	250	500	1000	2000	4000
6” diameter	7	31	40	38	40	27
8” diameter	13	29	36	35	38	22
12” diameter	21	28	29	33	26	12

I. Flexible Duct Connectors:
   1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.13 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers (control dampers for fans 2,000CFM and larger) at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.
   2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. On both sides of duct coils.
   2. Upstream from duct filters.
   3. At outdoor-air intakes and mixed-air plenums.
   4. At drain pans and seals.
   5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly, and for fan powered boxes with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect flexible ducts to metal ducts with stainless steel draw bands.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 237313 - MODULAR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. **INSTALLATION OF CHILLED WATER AHU THAT HAS BEEN PRE-PURCHASED BY OWNER.**
2. **EQUIPMENT SUBMITTALS HAVE BEEN PROVIDED FOR CONTRACTOR'S INFORMATION.**
3. **CONTRACTOR SHALL COMPLY FULLY WITH SPECIFICATIONS SECTION PART 1 - GENERAL, AND PART 3 - EXECUTION.**
4. **COORDINATE WITH SUPPLIERS FOR EXACT BOM. PROVIDE ALL HYDRONIC SPEACIALTIES AND ACCESSORIES THAT ARE SPECIFIED AND REQUIRED.**

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 150 percent of internal static pressures indicated or 8 inch w.g. whichever is less, without panel joints exceeding a deflection of L/240 where "L" is the unsupported span length within completed casings.

1.4 SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions and weight.
2. Cabinet material, metal thickness, finishes, insulation, and accessories.
3. Fans:
    a. AMCA 210 certified fan-performance curves with system operating conditions indicated.
    b. AMCA 301 certified fan-sound power ratings.
    c. Fan construction and accessories.
    d. Motor ratings, electrical characteristics, and motor accessories.
4. Certified coil-performance ratings with system operating conditions indicated.
5. Dampers, including housings, linkages, and operators.
6. Filters with performance characteristics.

B. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

C. Source quality-control reports.

D. Field quality-control reports.

E. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate loose parts shipped by the supplier.

B. Coordinate with supplier for installation instructions and details.

C. Coordinate field provided services such as startup, and warranty included in the original purchase order of the equipment.

D. Coordinate base size with condensate drain connection opening and requirements for condensate drain trap size.

E. Coordinate side of coil connections and access doors. Coordinate exact dimensions of custom openings for supply, return and fresh air. Coordinate dimensional limitations.

F. Since spatial constraints are an important consideration, coordinate site conditions, space availability for equipment, maintenance and NEC clearances, etc., prior to submitting bids.

1.7 WARRANTY

A. The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Special Warranty: Equipment manufacturer will provide warranty documentation per the pre-purchase agreement.

C. Contractor shall provide the installation and labor warranty for a period of 1 year after substantial completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Coordinate with Owner and equipment supplier the location of storage.

B. Contractor shall cooperate fully with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

C. Contractor, Owner's representative, and Manufacturer's representative shall inspect equipment to verify condition. Contractor, Owner's representative, and Manufacturer's representative shall note, in writing, any visible defects or damage to units. Contractor shall take possession of equipment for installation only if the units are accepted to be in good condition.

D. Contractor is responsible for equipment relocation process from storage facility to the site. Cooperate completely with supplier and Owner.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.
2. Fan Belts: One set for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See attached submittals.

2.2 UNITS

A. See attached submittals.

2.3 OIL SECTION

2.4 DAMPERS

A. See attached submittals.

B. Coordinate damper actuators on damper shafts with controls.

C. Damper Operators: Comply with requirements in Division 23 Section "Instrumentation and Control for HVAC."

2.5 ACCESSORIES

A. See attached submittals.

B. Provide float switch in primary drain pan, and interlock with fan motor to disable motor if drain line is clogged.

2.6 CONTROLS

A. Air handler controls shall be achieved through dedicated DDC programmable control modules as specified in Section 230900. Each AHU shall have a dedicated controller capable of achieving control sequences in stand-alone mode.

B. AHU manufacturer shall coordinate with work of Section 230900 to ensure DDC system can fully interact with the AHU without compromising any of the system safeties or warranties.

PART 3 - EXECUTION

3.1 INSTALLATION, DELIVERY, AND STORAGE

A. Contractor shall coordinate with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

B. Installation of equipment is sole responsibility of Contractor. Supplier will offer assistance according to standard practice and as required by these specifications.

C. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible.

D. Cover Products with impervious sheet covering. Provide ventilation to avoid condensation.

E. Arrange storage of Products to permit access for inspection.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for hydronic or refrigerant, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Contractors providing units other than those used as the basis of design will assume all responsibility for changes required to accommodate units proposed.

F. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation of air handling units.

3.3 INSTALLATION

A. Arrange installation of units to provide access space around air-handling units for service and maintenance.

B. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

3.4 CONNECTIONS

A. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using line size, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction. Insulate condensate lines.

E. Hydronic Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." and Section 232116 Hydronic Piping Specialties." Connect to supply and return coil tappings with shutoff or balancing valve and union or flange at each connection.

F. Connect duct to air-handling units with flexible connections. Comply with requirements in Division 23 Section "Air Duct Accessories." Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections.

G. Electrical: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

H. Ground equipment according to Division 26 Section "Grounding and Bonding."

I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

J. Electrical and controls conduit connections at the AHUs: Seal the annulus of the conduit with fire-proof, air and watertight sealant to prevent air and condensate flow into or out of the AHU and FCU.

3.5 FIELD QUALITY CONTROL

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Inspect, test, and adjust components, assemblies, and equipment installations, including connections.
1. Inspect field assembly of components and installation of central-station air-handling units including piping, ductwork, and electrical connections.
2. Prepare a written report on findings and recommended corrective actions.

C. Tests and Inspections:

1. Leak Test: After installation, test coils and connections for leaks.
2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. **Perform** startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.

4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Verify that proper thermal-overload protection is installed for electric coils.
9. Install new, clean filters.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for modular indoor air-handling system testing, adjusting, and balancing.

3.7 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.8 CLEANING

A. Clean modular indoor air-handling units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils entering air face.

B. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.9 DEMONSTRATION

A. **Train** Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION 237313

SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AHUS – ELECTRIC HEAT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. **INSTALLATION OF PACKAGED RTU EQUIPMENT THAT HAS BEEN PRE-PURCHASED BY OWNER.**
2. **EQUIPMENT SUBMITTALS HAVE BEEN PROVIDED FOR CONTRACTOR'S INFORMATION.**
3. **CONTRACTOR SHALL COMPLY FULLY WITH SPECIFICATIONS SECTION PART 1 - GENERAL, AND PART 3 - EXECUTION.**
4. **COORDINATE WITH SUPPLIERS FOR EXACT BOM. PROVIDE ALL REFRIGERANT SPEACIALTIES THAT ARE SPECIFIED AND REQUIRED, AND THAT HAVE BEEN EXCLUDED BY THE SUPPLIER.**

B. Refer to Div. 7 Specifications for roof curbs, restraints and attachments, and related delegated design scope of work.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design RTU supports and wind restraints to comply with **wind** performance requirements.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:

1. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
2. Structural members to which RTUs will be attached.
3. Roof openings
4. Roof curbs and flashing.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Wind Loading Qualification Certification: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Division 23 Sections.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

G. Certified Compliance Statement and shop drawings from a licensed PE for IBC and TDI.
1. Sealed shop drawings showing installation instructions and attachment of equipment to curb, and curb to structure. Include quantity and type of restraining brackets/clips, screws, spacing, etc.
2. As a separate attachment provide sealed IBC and TDI compliant calculations for curbs and attachment.

1.5 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. ARI Certification: Units shall be ARI certified and listed.

E. ARI Compliance for Units with Capacities Less Than 135,000 Btuh: Rate rooftop air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."

1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

F. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."

1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

G. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

H. UL Compliance: Comply with UL 1995.

I. 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.

J. International Building Code and TDI Compliance: Licensed Professional Engineer shall certify that the listed items are designed for and will withstand wind speed for the location of the project, per the relevant edition of International Building Code, ASCE Std 7, Texas Department of Insurance requirements.
1. Equipment curb/attachment for exterior and roof mounted equipment such as RTUs, ACCU, fans.
2. Attachment of equipment to curb/pad.
3. Attachment of curb/pad to building structure.

1.6 COORDINATION

A. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

C. Coordinate loose parts shipped by the supplier.

D. Coordinate with supplier for installation instructions and details.

E. Coordinate field provided services such as startup, and warranty included in the original purchase order of the equipment.

1.7 WARRANTY

A. The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Special Warranty: Equipment manufacturer will provide warranty documentation per the pre-purchase agreement.

C. Contractor shall provide the installation and labor warranty for a period of 1 year after substantial completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Coordinate with Owner and equipment supplier the location of storage.

B. Contractor shall cooperate fully with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

C. Contractor, Owner's representative, and Manufacturer's representative shall inspect equipment to verify condition. Contractor, Owner's representative, and Manufacturer's representative shall note, in writing, any visible defects or damage to units. Contractor shall take possession of equipment for installation only if the units are accepted to be in good condition.

D. Contractor is responsible for equipment relocation process from storage facility to the site. Cooperate completely with supplier and Owner.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: **One set** for each belt-drive fan (if applicable)
2. Filters: **One set** of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See attached submittals.

2.2 UNITS

A. See attached submittals.

2.3 ACCESSORIES

A. See attached submittals for what items are included, and items that excluded but required for this project per specifications.

B. Optional Accessories:
1. Copper condensate drain trap by contractor.
2. **Louvered** hail guards of steel, painted to match casing.
3. Condenser coil **E-coated or Energy Guard coil protection.**

4. Controls and control sensors by BAS (CO2 based DCV, limited range adjustable temperature sensors with LCD display, RH sensors). Coordinate with BAS.
5. Factory mounted controller with full digital touchscreen color display of sensor readings and diagnostics in a compartment isolated from airstream and rest of the unit.
6. Smoke detectors in return airstream for units greater than 2000CFM.
7. Blower proving switch, factory installed.
8. Phase monitor, factory installed.
9. MERV 13 filters.
10. **BACnet interface.**

2.4 ROOF CURBS

A. Roof Curb Adapters: Galvanized steel, gauge determined by PE performing wind analysis, corrosion-protection coating, supply and return air watertight gasketing and insulation, and factory-installed wood nailer; complying with NRCA standards. If new curbs are provided, minimum height shall be 18".
   1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
      a. Materials: ASTM C 1071, Type I or II.
      b. Thickness: **2 inches**.

   2. Application: Factory or field applied with adhesive and mechanical fasteners to the internal surface of curb.
      a. Liner Adhesive: Comply with ASTM C 916, Type I.
      b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
      c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
      d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Wind Restraints: Metal brackets compatible with the curb and casing, to match RTU base rail, used to anchor unit to the curb, and designed for loads at Project site.

2.5 DEHUMIDIFICATION SYSTEM

2.6 CONTROLS

A. Coordinate with BAS.

PART 3 - EXECUTION

3.1 INSTALLATION, DELIVERY, AND STORAGE

A. Contractor shall coordinate with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

B. Installation of equipment is sole responsibility of Contractor. Supplier will offer assistance according to standard practice and as required by these specifications.

C. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible.

D. Cover Products with impervious sheet covering. Provide ventilation to avoid condensation.

E. Arrange storage of Products to permit access for inspection.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to Architectural and Roofing manufacturer’s recommendation. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts.

B. Install wind restraints according to manufacturer's written instructions.

3.4 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."

4. Terminate return-air duct through roof structure and insulate space between roof and bottom of unit with 2-inch- thick, acoustic duct liner.

D. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

D. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Remove and replace malfunctioning units and retest as specified above.

3.6 STARTUP SERVICE

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, coils, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.

5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean condenser coil and inspect for construction debris.
9. Remove packing from vibration isolators.
10. Verify lubrication on fan and motor bearings.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Adjust fan belts to proper alignment and tension.
13. Verify refrigerant charge.
14. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Complete startup sheets and attach copy with Contractor's startup report.

15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Calibrate thermostats.
18. Adjust and inspect high-temperature limits.
19. Inspect outdoor-air dampers for proper stroke.
20. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

21. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
22. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Outdoor-air intake volume.

23. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

24. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on heater.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Smoke and firestat alarms.

25. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.7 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to **two** visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.8 DEMONSTRATION

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 237413

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. **INSTALLATION OF SPLIT-SYSTEM EQUIPMENT THAT HAS BEEN PRE-PURCHASED BY OWNER.**
   2. **EQUIPMENT SUBMITTALS HAVE BEEN PROVIDED FOR CONTRACTOR'S INFORMATION.**
   3. **CONTRACTOR SHALL COMPLY FULLY WITH SPECIFICATIONS SECTION PART 1 - GENERAL, AND PART 3 - EXECUTION.**
   4. **COORDINATE WITH SUPPLIERS FOR EXACT BOM. PROVIDE ALL REFRIGERANT SPEACIALTIES THAT ARE SPECIFIED AND REQUIRED, AND THAT HAVE BEEN EXCLUDED BY THE SUPPLIER.**

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ACCU wind restraints.

B. Wind-Restraint Performance rated for basic Wind Speed: Rated for the location.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Wind Restraints: Submit description of equipment anchorage devices and their installation requirements.

D. Field quality-control reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

D. International Building Code and TDI Compliance:
1. Equipment curb/attachment for exterior equipment such as ACCUs.
2. Attachment of equipment to curb/pad.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

B. Coordinate sizes, locations, and anchoring attachments of structural-steel support structures.

C. Coordinate loose parts such as neoprene vibration isolators shipped by the supplier.

D. Coordinate with supplier for installation instructions and details.

E. Coordinate field provided services such as startup, and warranty included in the original purchase order of the equipment.

1.7 WARRANTY

A. The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Special Warranty: Equipment manufacturer will provide warranty documentation per the pre-purchase agreement.

C. Contractor shall provide the installation and labor warranty for a period of 1 year after substantial completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Coordinate with Owner and equipment supplier the location of storage.

B. Contractor shall cooperate fully with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

C. Contractor, Owner's representative, and Manufacturer's representative shall inspect equipment to verify condition. Contractor, Owner's representative, and Manufacturer's representative shall note, in writing, any visible defects or damage to units. Contractor shall take possession of equipment for installation only if the units are accepted to be in good condition.

D. Contractor is responsible for equipment relocation process from storage facility to the site. Cooperate completely with supplier and Owner.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: **One** set for each air-handling unit.
   2. Fan Belts: **One** set for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See attached submittals.

2.2 INDOOR UNITS

A. See attached submittals.

2.3 OUTDOOR UNITS

A. See attached submittals.

2.4 ACCESSORIES

A. See attached submittals for what items are included, and items that excluded but required for this project per specifications.

B. Provide motorized OA and RA dampers, CO2 sensors, demand-controlled ventilation, and interlocks as follows.
   1. Motorized OA damper interlocked with compressor, such that when compressor cycles off, OA damper closes.
   2. Motorized OA and RA dampers shall modulate to maintain CO2 setpoints.

C. Other:
1. Low Ambient Controller: Cycles condenser fan to permit operation down to 35 deg F with time-delay relay to bypass low-pressure switch.
2. Package with refrigerant circuit suction and discharge gauges, and service valves.
3. Automatic-reset timer to prevent rapid cycling of compressor.
4. Site glass, filter-dryer.
5. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
6. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
7. Thermostatic expansion valve to match with existing Evaporator Coil, if existing is incompatible.
8. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.
9. Evaporator defrost controller.
10. Liquid line solenoid valves, electric unloaders, factory/field installed accumulators to accomplish stages of unloading.
11. See drawing schedules.

D. Unit Casing:
1. Condenser coil louvered hail guard to protect coil from physical damage.
2. Condenser coil coating: epoxy coat or Energy Guard
3. Wind Restraints: Bolts or metal brackets compatible with the curb and casing, painted to match unit, used to anchor unit to the pad or curb, and designed for loads at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION, DELIVERY, AND STORAGE

A. Contractor shall coordinate with supplier to ensure smooth, trouble-free installation in compliance with manufacturer's recommended procedures and these specifications.

B. Installation of equipment is sole responsibility of Contractor. Supplier will offer assistance according to standard practice and as required by these specifications.

C. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible.

D. Cover Products with impervious sheet covering. Provide ventilation to avoid condensation.

E. Arrange storage of Products to permit access for inspection.

3.2 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounted, compressor-condenser components on 4-inch- thick, reinforced concrete base that is 4 inches larger, on each side, than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install roof-mounted, compressor-condenser components on reinforced structural supports.

E. Install and connect refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

F. Provide auxiliary drain pans with float switches to disable fans. Provide drain piping with stop valves from pans to floor drains.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Duct Accessories."

D. Ground equipment according to Division 16 Section "Grounding and Bonding."

E. Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

3.4 FIELD QUALITY CONTROL

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Verify that air-conditioning units are installed and connected according to manufacturer's written instructions and the Contract Documents.
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
   3. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
   4. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
   5. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
   6. Comb coil fins for parallel orientation.
   7. Verify that proper thermal-overload protection is installed for electric coils.
   8. Install new, clean filters.
   9. Verify that manual and automatic volume control and fire and smoke dampers in connected
   10. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
   11. Measure and record motor electrical values for voltage and amperage.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.

D. Complete installation and startup checks according to manufacturer's written instructions.

E. After startup service and performance test, change filters.

F. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 DEMONSTRATION

A. Coordinate with Manufacturer to provide a factory-authorized service representative to perform this service.

B. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 260010 - SUMMARY OF ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 26 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Scope of Work:

1. General: The "South Texas ISD HVAC Repairs" consists of existing single-story buildings at various campuses. These building will generally be operated from 8:00am to 5:00pm. (Monday through Friday) with occasional after hours and weekends use.
2. Electrical: Provide all materials and labor associated with complete operational electrical distribution system. Major items of work include, but are not limited to:

(a) Electrical Service: Existing to remain with modifications.

(b) Demolition: Disconnect existing HVAC equipment as noted drawings

(c) Power Systems: Provide connections for HVAC equipment.

(d) Fire Alarm System: Deprogram, disconnect existing HVAC duct smoke detectors, wiring and reconnect. Provide new HVAC duct smoke detectors where noted on drawings.

(e) Commissioning: Provide for the lighting equipment and lighting controls as required per IECC 2018.

1.3 ALLOWANCES

A. Electrical: See Division 1 for electrical allowances.

1.4 COORDINATION

A. All electrical work shall be done under sub-contract to a General Contractor, who ultimately responsible for the entire project. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.

B. All questions, requests for information, submittals, and correspondence from the Electrical Contractor shall be submitted via the General Contractor, who will forward to the Architect, who will then forward to the Engineer.

C. Electrical Contractor shall not make any changes to design without written authorization from the Engineer. If changes are requested by the Owner, Architect, General Contractor, Suppliers, Manufacturers, or any others, Contractor should issue a written RFI for response by the Engineer.

D. Electrical Contractor shall issue seven (7) days written notice prior to any activities that require the presence of the Engineer at the job-site. This applies to all inspections required by specifications, and particularly to those where work will be covered (underground raceways, electrical raceways above ceiling).

E. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

F. Fully coordinate with Mechanical Contractor for providing power to HVAC equipment.

G. Issue written notification of the following tasks and allow five (5) days for Engineer to respond and schedule an inspection as required:

1. Upon completion of underground raceways installation and prior to covering up.
2. Upon completion of installing all raceways, labeling all j-boxes and prior to suspended ceiling installation.
3. Upon completion of pulling all wiring, making all terminations, labeling and color-coding wires at the panelboards/switchboards and prior to installing their covers.
4. When ready to request manufacturer’s start-up of each piece of equipment.
5. When ready for Substantial Completion Inspection.
6. When ready for Final Inspection.

H. Failure to issue written notification may result in work having to be redone to allow for proper inspection. It is this contractor’s responsibility to make sure Engineer receives notification.

1.5 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.
4. Coordinate with utility for electrical service. Base bid shall include all costs associated with service connection, including permit fees.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the job site.

1.7 SUBMITTALS - Special Requirements

A. All submittals need to comply with submittal requirements as outlined on this Pre-Construction Meeting Agenda & specifications.

B. Electrical Submittals shall be submitted electronically. Please organize the files as noted below (Native PDF format & searchable format). Files would need to be properly identified (cover letter, stamped, etc.) from the general contractor.

C. All submittals to be separated by sections and identified by section #s, in native and searchable pdf format. All selections/markings or highlighting made on the submittal shall be specific for project requirements and exactly for what the Contractor is intending to provide on the project. If submittal does not specify as to which model/options will be used by highlighting or marking the submittal, then submittal will be returned as rejected.

D. Manufacturer's standard dimensioned drawings, performance and product data shall be edited to delete reference to equipment, features, or information which is not applicable to the equipment being supplied for this project. Including Bill or List of Materials.

E. Individual submittals shall not be reviewed until a complete package is received.

F. Allow two weeks for initial review by Engineer, from the day it is received.

G. After being released by GC, Subcontractor shall have one week to respond to our submittal/re-submittal review comments.

H. Allow one week for review of resubmittals by Engineer, from the day it is received.

I. All submittal review comments shall be forwarded by Engineer to Architect, who will then distribute as per Division 1.

J. Provide detailed coordination drawings showing how mechanical, electrical & plumbing system components will be installed in coordination with work by others. Engineer’s drawing files will be made available to Contractor for producing coordination and as-built drawings upon request.

1. Miscellaneous Electrical – Submittal #1

a. 260519 Low-Voltage Electrical Power Conductors and Cables

b. 260526 Grounding and Bonding for Electrical Systems
c. 260529 Hangers and Supports for Electrical Systems
d. 260533 Raceways and Boxes for Electrical Systems
e. 260553 Identification for Electrical Systems
f. 260544 Sleeves and Sleeve Seals for Electrical Raceways and Cabling

2. Electrical Gear Submittal #2
a. 262416 Panelboards
b. 262816 Enclosed Switches and Circuit Breakers

3. Electrical Commissioning Submittal #3
a. 267210 Fire Alarm System

4. Electrical Commissioning Submittal #4
a. 260800 Commissioning for Electrical Systems

1.8 SCHEDULE OF VALUES -Special Requirements

A. Electrical Contractor shall submit a Schedule of Values reflecting the total value of Electrical Work in the Contract and broken down into the following items as a minimum, with a line item for Materials/Equipment and another for Labor.

ELECTRICAL
1. Electrical Gear.
2. Raceways Including Wiring.
3. Fire Alarm.
4. Commissioning
5. Allowances.
6. Miscellaneous.
7. Administrative and project management.

1.9 CODE COMPLIANCE:

The design for this project is based on:
1. Occupational Safety and Health Act (OSHA)
2. National Electric Code (NEC)
3. National Fire Code
4. International Building Code
5. UL 916
6. Local ordinances

END OF SECTION 260010

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member Company of NETA or an NRTL.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturer:

1. Senator Wire & Cable Company.
2. Southwire Company.
3. Encore Wire

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2, Type XHHW-2 and Type SO.

2.2 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Stranded Copper.

B. Branch Circuits: Stranded Copper. Except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls and Partitions: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, which will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section "Operation and Maintenance Data," include the following:

a. Instructions for periodic testing and inspection of grounding features at ground rings and grounding connections for separately derived systems based on and NFPA 70B.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Stranded Copper.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Single-phase motor and appliance branch circuits.
3. Three-phase motor and appliance branch circuits.
4. Flexible raceway runs.

5. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Manhole Grounds: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Hangers.
b. Steel slotted support systems.
c. Nonmetallic support systems.
d. Trapeze hangers.
e. Clamps.
f. Turnbuckles.
g. Sockets.
h. Eye nuts.
i. Saddles.
j. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Nonmetallic slotted-channel systems.
4. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which hangers and supports will be attached.
3. Size and location of initial access modules for acoustical tile.
4. Items penetrating finished ceiling, including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Projectors.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.

e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Material: Plain steel.
3. Channel Width: 1-1/4 inches.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
8. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
    a. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
    b. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
    c. Toggle Bolts: All-steel springhead type.
    d. Hanger Rods: Threaded steel.
    e. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
    f. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
    g. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
    h. Toggle Bolts: All-steel springhead type.
    i. Hanger Rods: Threaded steel

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs and RMCs as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in] NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

    1. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, and RMCs may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Architectural Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Sections "Exterior Painting", "Interior Painting" and "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

C. EMT: Electrical metallic tubing.

D. FMC: Flexible metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.
10. Hylsa

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel (Zinc is not acceptable).
b. Type: set-screw.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVCcomplying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Fittings for and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 4X SS, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Spring City Electrical Manufacturing Company.
10. Thomas & Betts Corporation.
11. Walker Systems, Inc.; Wiremold Company (The).

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.

I. Gangable boxes are allowed as along is permitted by the NEC.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for indoor applications and Type 4X (stainless steel) outdoor with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 1 or Type 4XSS box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.
d. NewBasis.

3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC".
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 18 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4SS.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC, Type EPC-40-PVC TO EMT or GRC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 3 for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 3."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 3."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical- resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical- resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Underground-Line Detectable Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 30-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels or legible permanent ink (both sides) with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. Control Wiring.

C. Power-Circuit Conductor Identification: For secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line detectable warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self- adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

M. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches high.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Distribution panelboards and Switchboards – label each circuit breaker.
c. Access doors and panels for concealed electrical items.
d. Electrical switchgear and switchboards.
e. Emergency system boxes and enclosures.
f. Disconnect switches.

3.3 INSTALLATION

Verify the identity of each item before installing identification products.

END OF SECTION 260553

SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for the following MEP systems, assemblies, and equipment:

1. Electrical and Electrical Powered Equipment.

B. Related Requirements:

1. Section 019113 "General Commissioning Requirements" for general commissioning process requirements and Commissioning Coordinator responsibilities.

1.3 DEFINITIONS

A. Refer to Section 019113 "General Commissioning Requirements" for additional definitions and assignment of responsibilities.

1.4 CONTRACTOR’S RESPONSIBILITIES

A. Refer to Section 019113 "General Commissioning Requirements".

B. Perform commissioning tests at the direction of the CxA.

C. Attend construction phase controls coordination meeting.

D. Participate in electrical systems, assemblies, equipment, and component maintenance orientation and inspection.

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 complete range of testing for the required test period.

G. 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.

H. Direct and coordinate commissioning testing among subcontractors, suppliers, and vendors.

I. Verify testing and adjusting of Work are complete.

J. Provide test data, inspection reports, and certificates in Systems Manual.

1.5 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for electrical systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
5. Certificate of readiness certifying that electrical systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.

1.6 INFORMATIONAL SUBMITTALS

A. Construction Checklists: See related Sections for technical requirements, and generate construction checklists for the following:

1. Revise list of construction checklists below to suit Project. Coordinate list with appropriate related Sections' content. Below are examples of common construction checklists.

2. Electrical lighting and lighting control systems.

B. Certificates of readiness.

C. Certificates of completion of installation, pre-start, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Refer to Section 019113 "General Commissioning Requirements".

3.2 SYSTEMS READINESS CHECKLISTS

A. Construction Checklists: Assist CxA in the preparation of detailed Systems Readiness checklists for systems, subsystems, equipment, and components.

1. Contributors to the development of checklists shall include, but are not limited to:
    a. Systems and equipment installers.
    b. Electrical technicians.

B. Contractor shall conduct Systems Readiness Testing to document compliance with installation and Systems Readiness checklists prepared by Commissioning Authority for Division-26 items.

C. Refer to Section 019113 "General Commissioning Requirements" for issues relating to Systems Readiness checklists and testing, description of process, details on non-conformance issues relating to pre-functional checklists and test.

D. Contractor shall participate in Pre-Functional testing activities to document electrical work associated with mechanical and plumbing systems.

3.3 SYSTEM START-UP

A. Contractor is solely responsible for system start-up. CxA may, at his discretion, witness start up procedures, but will not perform any Functional Testing of systems until Contractor has completed start-up and resolved all operating deficiencies.

3.4 TESTING PREPARATION

A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents and approved Shop Drawings and submittals, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, and alarm conditions).

D. Inspect and verify the position of each device and interlocks identified on checklists.

E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as required.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of automation system controllers and sensors.

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 Contracting Officer 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.

F. 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.

G. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

H. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.6 FUNCTIONAL TEST PROCEDURES FOR SYSTEMS TO BE COMMISSIONED

A. General

1. The following paragraphs outline the functional test procedures for the various Div. 26 items to be commissioned. Functional testing will take place only after System Readiness checklists have been completed, equipment has been started-up, and Contractor has certified that systems are ready for functional testing.
2. All systems controlled via the Building Automation System shall have all control points and sequences tested by Controls Contractor prior to requesting testing by CX Authority.

3.7 COMMISSIONING TESTS

A. All Electrical and Electrically Powered Equipment:

1. Inspect electrical wiring and grounding for proper connection, color coding, and quality of installation.
2. Verify supply voltage, all hot legs.
3. Verify amperage is within allowable limits.
4. Inspect for physical damage proper installation, anchorage.
5. Verify equipment runs smoothly and quietly.
6. Verify operation of safeties.

7. Verify all required means of disconnect are in place.
8. Verify maintenance and NEC clearances are maintained.

B. Electrical Distribution System Switchboards and Panelboards:
1. Verify wiring connections are secure.
2. Verify ground wires are properly terminated.
3. Verify wiring color coding is correct.
4. Verify panel is properly identified.
5. Verify load identification is adequately descriptive of load.

C. Customized system readiness checklists and function testing requirements will be released after the submittal review phase.

3.8 TRAINING AND O&M MANUALS

A. Refer to Div. 26 specifications.

END OF SECTION 260800

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member Company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and or Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's or Construction Manager's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D Co.
2. Eaton Corporation.
3. Siemens
4. General Electric ABB

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac (as per connected voltage), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicate**d** fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac (as per connected voltage), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.

C. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION 262816

SECTION 267210 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Deprogram and disconnect existing duct smoke detectors at existing HVAC equipment to be removed. Reconnect and reprogram for new HVAC equipment. Coordinate work with owner's fire alarm.

B. Fully coordinate with the HVAC contractor for the Fire Alarm HVAC equipment (over 2,000 cfm's) duct smoke detectors interfacing.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. HVAC Controls - "Electric Control Systems for duct smoke detectors. HVAC down relay. (AHU shut down relay furnished by Fire Alarm Contractor).

D. Definitions:

1. FACP: Fire alarm control panel.
2. LED: Light-emitting diode.
3. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

E. System Description:

1. Noncoded, addressable system; multiplexed signal transmission dedicated to fire alarm service only.

F. Performance Requirements:

1. Comply with NFPA 72.
2. Fire alarm signal initiation shall be by one or more of the following devices:

a. Manual stations.
b. Heat detectors.
c. Smoke detectors.
d. Verified automatic alarm operation of smoke detectors.
e. Automatic sprinkler system water flow.
f. Fire extinguishing system operation.

3. Fire alarm signal shall initiate the following actions:

a. Visual notification appliances shall operate continuously.
b. Identify alarm at the FACP and remote annunciators.
c. Audible notification appliances shall operate continuously until silenced.
d. Visual notification appliances shall continue to operate until reset.
e. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
f. Release fire and smoke doors held open by magnetic door holders.
g. Transmit an alarm signal to the remote alarm receiving station

h. Record events in the system memory.

4. Supervisory signal initiation shall be by one or more of the following devices or actions:

   a. Operation of a fire-protection system valve tamper.
   b. Operation of a fire-protection system valve flow.

5. System trouble signal initiation shall be (per building) by one or more of the following devices or actions:

   a. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
   b. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
   c. Loss of primary power at the FACP.
   d. Ground or a single break in FACP internal circuits.
   e. Abnormal ac voltage at the FACP.
   f. A break in standby battery circuitry.
   g. Failure of battery charging.
   h. Abnormal position of any switch at the FACP or annunciator.
   i. Fire-pump power failure, including a dead-phase or phase-reversal condition.

6. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators. Record event.

G. AHU SHUT DOWN

1. When a fire alarm condition is detected by AHU duct smoke detector and reported, the following functions shall immediately occur:

   a. The system alarm LED on the FACP shall flash.
   b. A local piezo electric signal in the control panel shall sound.
   c. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
   d. This particular AHU shall be shut down only; the remaining AHU’s shall remain operational.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
2. Device Address List: Coordinate with final system programming.

3. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
4. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
5. Batteries: Size calculations.

C. Field quality-control test reports.

D. Operation and maintenance data.

E. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

F. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.

    a. Hard copies on paper to Owner, Architect, and authorities having jurisdiction.
    b. Electronic media may be provided to Architect and authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer shall provide proof of their qualifications as Factory Authorized and Factory Trained for the product(s) specified herein. These documents shall be included in the submittal package. A letter from the manufacturer stating that the Contractor is the Factory Authorized Distributor for the submitted equipment shall be included in the submittal package.
2. The installing Contractor (Company) shall have completed a minimum of five projects of similar size and scope within the past five years. Provide a list of completed projects to include names and phone numbers of the Owner's representative and the General Contractor for the project.
3. Contractor Personnel Requirements:
    a. One full time employee with a current Texas Fire Alarm Planning Superintendents License.
    b. One full time employee with NICET Level III certification.
    c. A minimum of two technicians with Factory Training for the submitted product(s). Copies of License, NICET Certification, and Factory Training shall be included in the submittals.

d. The installation shall be performed by licensed full time employees of the Factory Authorized Distributor.

B. 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.

C. A factory-authorized Installer is to perform the Work of this Section. Installer is to be licensed by Texas Commission on Fire Protection as Fire Alarm Technician or Fire Alarm Planning Superintendent. Texas Commission on Fire Protection shall license installing company. Provide copies of licensing with submittal.

D. Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authority having jurisdiction.

E. Comply with Article 5.43-2 Insurance code and fire alarm rules as required by Texas Commission on Fire Protection.

F. Comply with Article 5.43-2 Insurance code and fire alarm rules as required by Texas Commission on Fire Protection.

G. NFPA Compliance: Provide fire alarm and detection systems conforming to the requirements of the following publications:

1. NFPA 72, "Installation, Maintenance, and Use of Protective Signaling Systems."
2. NFPA 72E, "Automatic Fire Detectors."
3. NFPA 72G, "Guide for the Installation, Maintenance and Use of Notification Appliances for Protective Signaling Systems."

H. NRTL Listing: Provide systems and equipment that are listed and labeled.
1. Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

I. UL Compliance: All devices are to be UL listed for Fire, Security, and Access Control.

J. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility for system components.

1.4 WARRANTY

A. Guarantee all labor and equipment furnished under this bid package for a period of five (5) years commencing from the date of final system acceptance, including annual inspections of the system.

B. During the warranty period report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Warranty service shall be rendered within 24 hours after request by Owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FACP and Equipment:

a. Notifier - Existing No Substitutions Edinburg

b. Notifier - Existing No Substitutions Mercedes

c. Farenhyt IFP-2100ECS – Existing No Substitutions Olmito

2. Wire and Cable:

a. Comtran Corporation.
b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
d. West Penn Wire/CDT; a division of Cable Design Technologies.

3. Audible and Visual Signals:

a. Edwards Systems Technology Inc.
b. Commercial Products Group.
c. Gentex Corporation.
d. System Sensor; a GE-Honeywell Company.

2.2 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Multipurpose type, containing the following:

a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
b. Heat sensor, combination rate-of-rise and fixed temperature.

4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.

B. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:

a. Sensor: LED or infrared light source with matching silicon-cell receiver.
b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated status. Provide remote status and alarm indicator and test station where indicated.
7. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
8. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.3 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.

1. Connect new equipment to the existing control panel in the existing part of the building.

2. Expand, modify, and supplement the existing control equipment as necessary to extend the existing control functions to the new points. New components shall be capable of merging with the existing configuration without degrading the performance of either system.

B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

D. Remote Status and Alarm Indicators: Install near each smoke detector that is not readily visible from normal viewing position.

E. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes for Electrical Systems."

1. NECA 1.
2. TIA/EIA 568-A.
3. Public areas with exposed structure, all wiring shall be concealed in raceway.
4. Stub up raceways into accessible ceiling space.
5. Install wiring in raceways except in accessible indoor ceiling spaces. Secure wiring from building structure steel (no walls) by means of J-hooks. Where available lay out cables in cable tray.
6. Conceal raceways and wiring except in unfinished spaces and as indicated.
7. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
8. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes for Electrical Systems."

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour fire-rated fire alarm cables, NFPA 70 Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section “Electrical Identification."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters.
3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.

    a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Semiannual Test and Inspection: Six months after date of Substantial Completion and for the following three years, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 267210

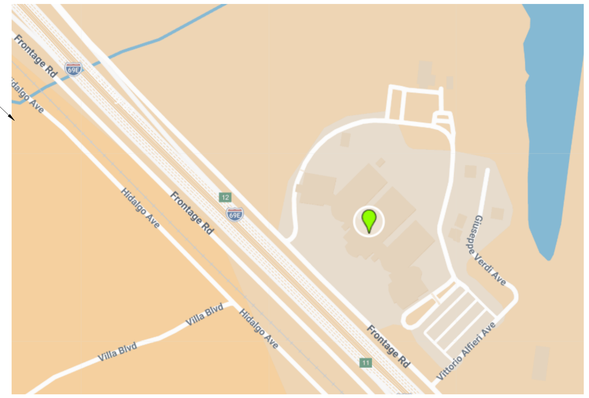
STISD - HVAC PROJECT 26-27

HEALTH PROFESSIONS CAMPUS, MEDICAL PROFESSIONS CAMPUS, WORLD SCHOLARS CAMPUS

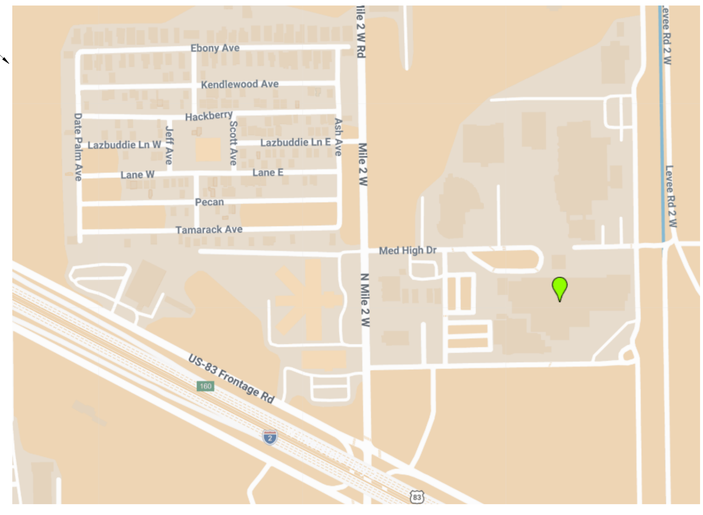
MERCEDES TEXAS, OLMITO TEXAS, EDINBURG TEXAS

VICINITY MAP

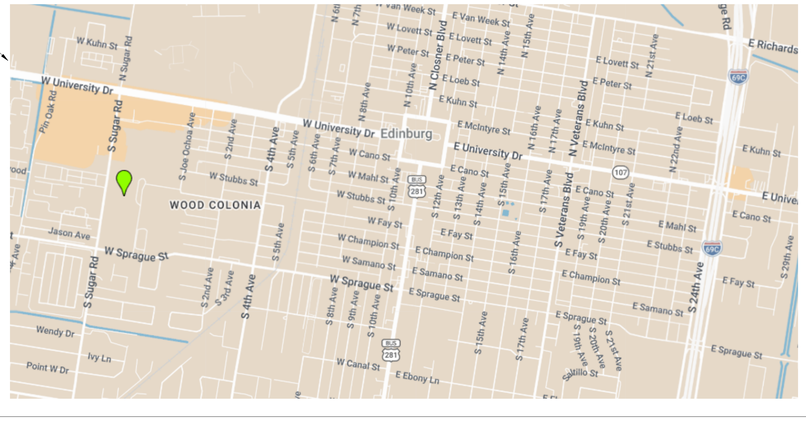
MEDICAL PROFESSIONS
10650 NORTH EXPRESSWAY 77/83
OLMITO, TX 78575



HEALTH PROFESSIONS
700 MED HIGH DR.
MERCEDES, TX 78570



WORLD SCHOLARS
501 S. SUGAR RD.
EDINBURG, TX 78539



SCOPE OF WORK:

A. THE FOLLOWING SUMMARY OF WORK IS INTENDED AS AN AID TO ACHIEVE AN UNDERSTANDING OF THE VARIOUS ELEMENTS OF WORK INCLUDED IN THE PROJECT, AND IS NOT INTENDED TO BE ALL-INCLUSIVE. DETAILED DESCRIPTIONS OF WORK AND REQUIREMENTS ARE GIVEN IN DRAWINGS AND SPECIFICATIONS.

B. MECHANICAL CONTRACT DOCUMENTS WERE PREPARED FOR THE PROJECT BY:
ETHOS ENGINEERING,
1126 SOUTH COMMERCE STREET
HARLINGEN, TEXAS 78550
PHONE NUMBER: (956) 230-3435

C. SCOPE OF WORK IS BROKEN DOWN AS FOLLOWS:
1. BASE BID: REPLACEMENT OF HVAC SYSTEMS AND CONTROLS.
   A. DEMOLISH EXISTING SYSTEMS.
   B. INSTALL OWNER PRE-PURCHASED HVAC SYSTEMS INCLUDING DX RTUS, DX SPLIT SYSTEMS, HYDRONIC AHUS, VFDS, DUCT AND PIPING MODIFICATIONS.
   C. PROVIDE SYSTEMS MODIFICATIONS INCLUDING DUCTWORK MODIFICATIONS, AND RELATED CONTROLS UPGRADES. SEE DRAWINGS FOR DETAILS.
2. ALTERNATE #1: REPLACEMENT OF AIR DISTRIBUTION SYSTEMS, ZONE DAMPERS, BYPASS DAMPERS, DUCTWORK, AIR DEVICES, AND RELATED CONTROLS. RETAIN AND REUSE EXISTING AHUS AS INDICATED.

D. SCOPE OF WORK:
1. BASE BID: SCOPE OF WORK RELATED TO NEW ADDITION:
   A. DUCTWORK, DIFFUSERS, GRILLES, DYNAMIC FIRE DAMPERS, CONTROL DAMPERS, ZONE DAMPERS, OA INTAKE LOUVERS, AND OTHER ACCESSORIES.
   B. TESTING, ADJUSTING, & BALANCING (TAB) SHALL NOT BE PROVIDED UNDER THE MECHANICAL CONTRACT. GENERAL CONTRACTOR TO PROVIDE TAB. COORDINATE WORK.
   C. EXPAND EXISTING BUILDING AUTOMATION SYSTEM AND PROVIDE BAS CONTROLS PER SECTIONS 230900 AND 230993. COORDINATE WITH EQUIPMENT MANUFACTURER, AND PROVIDE BACNET INTEGRATION.
   1) RTUS COME WITH INTEGRAL CONTROLLERS. BACNET INTERFACE WILL BE USED TO INTEGRATE WITH BAS.
   2) VIA BACNET BAS SHALL SET TIME SCHEDULES, SETPOINTS, AND MONITOR ADDITIONAL PARAMETERS AND ALARM CODES FROM RTU CONTROLLERS. BAS SHALL SEND ALARMS/TEXTS PER SPECIFICATIONS.
   3) CLOSELY COORDINATE WHO WILL PROVIDE T/RH/CO2 SENSORS (BAS OR EQUIPMENT MANUFACTURER). PROVIDE AND INTEGRATE ADJUSTABLE LIMITED-RANGE THERMOSTATS. CONNECT TO CENTRAL OPERATOR'S STATION VIA COMMUNICATIONS NETWORK.
   4) CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF CONTROLS RELAYS, CONTACTORS, POWER TO DDC PANELS, AND OTHER CONTROLS EQUIPMENT. ALTHOUGH CONTRACTOR MAY COORDINATE WITH OTHER TRADES TO PROVIDE MISCELLANEOUS ELECTRICAL AND MECHANICAL WORK, THE FINAL RESPONSIBILITY FOR ACHIEVEMENT OF CONTROL SEQUENCES LIES WITH THE MECHANICAL CONTRACTOR.
2. BASE BID: SCOPE OF WORK RELATED TO REFRESH AND RENOVATIONS:
   A. DEMOLITION: DEMOLISH LISTED EQUIPMENT AND MATERIALS. RETAIN AND REUSE HVAC EQUIPMENT AS DESIGNATED.
   1) REMOVE REFRIGERANT AND DELIVER TO OWNER.
   2) REMOVE ACCU, ELECTRIC DUCT HEATER, DUCTWORK AND ACCESSORIES, CONTROLS SYSTEMS, AND MISCELLANEOUS EQUIPMENT AND MATERIALS. REMOVE PIPING CONNECTIONS, REFRIGERANT PIPING AND SPECIALTIES, PIPING SUPPORTS, INSULATION, ETC. AS INDICATED IN PLANS TO MAKE ROOM FOR NEW EQUIPMENT.
   B. NEW WORK:
   1) NEW HVAC SYSTEMS SUCH AS ACCU, VAV BOXES, AIR-DISTRIBUTION SYSTEMS AND DUCTWORK MODIFICATIONS, DUCTWORK, DAMPERS, AND DUCT ACCESSORIES, AND AIR DEVICES. SEE DRAWINGS FOR DETAILS.
   2) FOR REUSED REFRIGERANT PIPING, PROVIDE CLEANING AND VACUUMING OF EXISTING REFRIGERANT PIPING TO BE REUSED. PROVIDE NEW REFRIGERANT PIPING SPECIALTIES, PIPE INSULATION, JACKETING, PIPE SUPPORTS, AND MISCELLANEOUS ACCESSORIES.
   3) WASH AND CLEAN EXISTING AHU COILS, CLEAN DRAIN PAN, VERIFY OPERATION OF DAMPERS AND ACTUATORS.
   4) PROVIDE "CGM" CONTROLLER, SENSORS, MOTORIZED DAMPER ACTUATORS, AND UPDATE GRAPHICS.
3. ALTERNATE BID: SCOPE OF WORK RELATED TO HVAC REPLACEMENTS:
   A. DESIGN INTENT:
   1) PROVIDE CAMPUSWIDE CONTROLS UPGRADES INCLUDING REPLACEMENT OF NETWORK ENGINES AND GRAPHICS PACKAGE.
   2) RETAIN AND REUSE DX AHUS AND REPLACE ACCUS.
   3) FOR REPLACED ACCUS, AND RELATED AHUS, REPLACE CONTROLS.
      A) BAS REPLACEMENT FOR AHU/ACCU-C WILL BE IMPLEMENTED UNDER A SEPARATE CONTRACT RELATED TO INTERIOR RENOVATIONS PROJECT. COORDINATE WORK CLOSELY WITH OWNER, ENGINEER, AND CONTRACTORS, SUCH THAT THERE IS NO DUPLICATION OR OMISSION OF WORK.
   B. DEMOLITION: DEMOLISH LISTED EQUIPMENT AND MATERIALS. THE OWNER HAS THE RIGHT OF FIRST REFUSAL. DISPOSE OF REMOVED ITEMS THAT THE OWNER NO LONGER WISHES TO KEEP. RETAIN AND REUSE HVAC EQUIPMENT AS DESIGNATED.
   1) REMOVE REFRIGERANT AND DELIVER TO OWNER.
   2) REMOVE HVAC EQUIPMENT, ELECTRICAL, AND CONTROLS EQUIPMENT, INCLUDING AIR-COOLED CONDENSING UNITS, CONTROLLERS, CONTROLS SENSORS, EXISTING DAMPER-ACTUATORS, AND MISCELLANEOUS EQUIPMENT AND MATERIALS. REMOVE PIPING CONNECTIONS, REFRIGERANT PIPING AND SPECIALTIES, PIPING SUPPORTS, INSULATION, ETC. AS INDICATED IN PLANS TO MAKE ROOM FOR NEW EQUIPMENT.
   3) SAVE EXISTING SMOKE DETECTORS, WIRING AND SAFETIES FOR REUSE. DOCUMENT DEVICES THAT ARE NOT IN WORKING ORDER.
   C. NEW WORK:
   1) REPLACE HVAC, ELECTRICAL, AND CONTROLS EQUIPMENT, RELATED TO AIR-COOLED CONDENSING UNITS. PROVIDE MODIFICATION OF REFRIGERANT PIPING, INSULATION, CONTROLS, AND ELECTRICAL SYSTEMS.
   2) EXISTING REFRIGERANT PIPING MAY BE REUSED, PROVIDED THE SIZES ARE APPROPRIATE AND APPROVED BY MANUFACTURER OF EQUIPMENT.
   3) WHERE REFRIGERANT PIPING IS REUSED, PROVIDE CLEANING AND VACUUMING OF EXISTING REFRIGERANT PIPING TO BE REUSED. PROVIDE NEW REFRIGERANT PIPING SPECIALTIES, PIPE INSULATION, JACKETING, PIPE SUPPORTS, AND MISCELLANEOUS ACCESSORIES.
   4) WASH AND CLEAN EXISTING AHU COILS, CLEAN DRAIN PAN, VERIFY OPERATION OF DAMPERS AND ACTUATORS
   5) FOR REPLACED ACCUS, REPLACE BAS CONTROLLERS FOR SPLIT SYSTEMS WITH NEW "CGM" CONTROLLERS, SENSORS, MOTORIZED DAMPER ACTUATORS AT AHUS, AND UPDATE GRAPHICS. RECOMMISSION CONTROLS TO ENSURE THE ORIGINAL SEQUENCES ARE FULLY OPERATIONAL.
   6) CAMPUSWIDE CONTROLS UPGRADES:
      A) REPLACE EXISTING NAE NETWORK ENGINES WITH NEW "SNE" SUPERVISORY CONTROLLERS.
      B) UPDATE GRAPHICS PACKAGE TO "MUI" THAT IS COMPATIBLE WITH THE METASYS SERVER.
      C) ENSURE THAT THE ENTIRE IDEA MCALLEN CAMPUS OPERATES UNDER A SEAMLESS AND STANDARDIZED MUI INTERFACE TO ENSURE CONSISTENCY, USABILITY, AND LONG-TERM SUPPORTABILITY ACROSS THE PORTFOLIO.
4. SHOP DRAWING SUBMITTALS FOR ALL MECHANICAL SYSTEMS SUCH AS EQUIPMENT, DUCTWORK AND PIPING, AND COORDINATION DRAWINGS FOR PLACING OF MECHANICAL SYSTEMS IN RELATION TO WORK BY OTHER DISCIPLINES.
5. PROVIDE WINDSTORM RESTRAINTS FOR EXTERIOR MOUNTED EQUIPMENT, ALONG WITH SEALED DRAWINGS AND CALCULATIONS SHOWING THAT RESTRAINTS MEET IBC REQUIREMENTS.
6. COORDINATE ELECTRICAL WORK WITH DIV. 26 AS REQUIRED.
7. COORDINATE FIRE ALARM RELATED WORK WITH FIRE ALARM CONTRACTOR. PROVIDE SMOKE DETECTORS, WIRING AND CONTROLS FOR UNITS, 2000 CFM AND LARGER, WHERE NONE EXIST.
8. PAINTING: SEE DIVISION 9 SPECIFICATIONS. PAINT ALL EXPOSED PIPING, DUCTWORK, INSULATION, HANGERS, ACCESSORIES IN INTERIOR EXPOSED AREAS. PAINT EXTERIOR PIPE SUPPORTS. COORDINATE PAINT TYPE, COLOR AND SCOPE OF WORK WITH ARCHITECT.
9. COMMISSIONING: PROVIDE ASSISTANCE WITH COMMISSIONING SERVICES PER SPECIFICATIONS. THIS INCLUDES COMPLETING SYSTEMS READINESS CHECKLISTS, PERFORMING FUNCTIONAL TESTING, PROVIDING OPERATOR TRAINING, ETC.

DATE OF ISSUE

JULY 31, 2026

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ME3.02	STISD HEALTH PROFESSIONS - MECHANICAL & ELECTRICAL FLOOR PLAN
ME4.01	STISD MEDICAL PROFESSIONS - DEMO MECHANICAL & ELECTRICAL FLOOR PLAN
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VACANT POSITION — MEMBER

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STISD HVAC Project 26-27
MERCEDES, OLMITO, & EDINBURG, TEXAS

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
07.31.2026

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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

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Drawn By:	Author
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Sheet:	COVER

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F-15998

8/3/2026 8:34:37 AM

ABBREVIATIONS

A	AMPS	EMS	ENERGY MANAGEMENT SYSTEM	NC	NORMALLY CLOSED
ABC	ABOVE CEILING LINE	ENT.	ENTERING	NIC	NOT IN CONTRACT
ACT	ACTUATOR	EXT.	EXTERNAL OR EXTERIOR	NO	NORMALLY OPEN
AFF	ABOVE FINISHED FLOOR	EXIST./EX	EXISTING	NTS	NOT TO SCALE
AHU	AIR HANDLING UNIT	FD	FIRE DAMPER	OA	OUTSIDE AIR
B.	BOTTOM	FM	FLOW METER	PH	PHASE
BAS	BUILDING AUTOMATION SYSTEM	FS	FLOW SWITCH	P	POLE(S)
BOP	BOTTOM OF PIPE	FPI	FINS PER INCH	RA	RETURN AIR
BOTT.	BOTTOM	G.	GROUND	RAG/RG	RETURN AIR GRILLE
C.	CONDUIT OR COMMON	GA.	GAGE	RD	ROOF DRAIN
CHR	CHILLED WATER RETURN	GALV.	GALVANIZED	RM.	ROOM
CHS	CHILLED WATER SUPPLY	GPM	GALLONS PER MINUTE	RPZ	REDUCED PRESSURE ZONE
CHW	CHILLED WATER	GRND.	GROUND	SA	SUPPLY AIR
CHWP	CHILLED WATER PUMP	HB	HOSE BIBB	SD	SUPPLY AIR DIFFUSER
CR	CONDENSER WATER RETURN	HP	HORSEPOWER	SS	STAINLESS STEEL
CS	CONDENSER WATER SUPPLY	HS	HUMIDITY SENSOR	SZ	SINGLE ZONE
CLG.	CEILING OR COOLING	HVAC	HEATING, VENTILATION, & AIR CONDITIONING	TAB	TESTING & BALANCING
COMB.	COMBINATION			TS	TEMPERATURE SENSOR
CONC.	CONCRETE	LVG.	LEAVING	TSTAT	THERMOSTAT
COND.	CONDUIT	MCA	MINIMUM CIRCUIT AMPACITY	TYP.	TYPICAL
CU.	COPPER	MECH	MECHANICAL	UG	UNDERGROUND
CW	CITY WATER	MOT. STRTR.	MOTOR STARTER	UNO	UNLESS OTHERWISE NOTED
DDC	DIRECT DIGITAL CONTROLS	MOCP	MAX. OVERCURRENT PROTECTION	V	VOLTS
DMPR.	DAMPER	MS	MOTOR STARTER	VAV	VARIABLE AIR VOLUME
DISC.	DISCONNECT	MZ	MULTI-ZONE	VFD	VARIABLE FREQUENCY DRIVE
EAG/EG	EXHAUST AIR GRILLE	N/A	NOT APPLICABLE	W	WIRE

ELECTRICAL GENERAL SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	DISCONNECT SWITCH - NON FUSED	AS REQUIRED
	DISCONNECT SWITCH - FUSED	AS REQUIRED
	COMBINATION MOTOR STARTER/DISCONNECT SWITCH	AS REQUIRED
	MOTOR STARTER	AS REQUIRED
	EQUIPMENT CONNECTION	AS REQUIRED
	ELECTRICAL PANELBOARD - SURFACE MOUNTED	AS REQUIRED
— — —	UNDERGROUND RACEWAY	AS REQUIRED
————	CONCEALED RACEWAY	AS REQUIRED

INSULATION:

1. FIBERGLASS INSULATION MAY NOT BE USED ON ANY COLD SURFACES; ONLY APPROVED CLOSED CELL INSULATION IS ACCEPTABLE.
2. PROVIDE INSULATION ON ALL SURFACES CAPABLE OF CREATING CONDENSATION.

ELECTRICAL:

1. ALL ELECTRICAL WORK SHALL BE UNDER THE MASTER ELECTRICIAN WHO PULLED THE PERMIT AND ITS JOURNEYMAN ELECTRICIANS.
2. PERFORM ALL WORK PER ADOPTED N.E.C. AND APPLICABLE STATE STANDARDS. UNLESS DRAWINGS OR SPECIFICATIONS HAVE MORE STRINGENT REQUIREMENTS.
3. UNLESS NOTED OTHERWISE, MINIMUM POWER CIRCUIT IS TO BE #12 THHN/THWN-2 WITH #12 GROUND IN 3/4" CONDUIT, WITH THE EXCEPTION THAT ANY CIRCUIT LONGER THAN 100 FEET SHALL BE MINIMUM #10 AWG WITH #10 GROUND WIRE. CIRCUIT LONGER THAN 200 FEET SHALL BE MINIMUM #8 AWG WITH #10 GROUND WIRE MINIMUM.
4. ALL EXISTING ID NAMETAGS AND CIRCUIT IDENTIFICATION MUST BE REVISED TO REFLECT CURRENT CONDITIONS FOR ALL EQUIPMENT WHICH IS NEW, REPLACED, OR DEMOLISHED. REMOVE ID NAMETAGS FOR DEMOLISHED EQUIPMENT. REPLACE EXISTING NAMETAGS WITH NEW FOR REPLACED EQUIPMENT, IF REPLACEMENT EQUIPMENT HAS DIFFERENT NAME. PROVIDE NEW NAMETAGS FOR ALL NEW EQUIPMENT. ALL CIRCUIT BREAKER DIRECTORIES FOR PANELS IN WHICH NEW WORK TAKES PLACE ARE TO BE REPLACED WITH NEW DIRECTORIES WHICH LIST EXISTING CIRCUITS AND NEW. ALL UNUSED CIRCUITS ARE TO BE MARKED AS 'SPARE' IN THE DIRECTORIES. DIRECTORIES ARE TO BE COMPUTER GENERATED; NO HAND WRITTEN DIRECTORIES ARE ACCEPTABLE.
5. HAND-WRITTEN CIRCUIT BREAKER DIRECTORIES WILL NOT BE ACCEPTED. DIRECTORIES MUST BE COMPUTER GENERATED AND PRINTED TO REFLECT FINAL INSTALLED CONDITIONS.
6. MARK ALL J-BOXES WITH INDELIBLE INK, INDICATING POWER CIRCUITRY INFORMATION. LABEL ALL EQUIPMENT ITEMS PER SPECIFICATIONS.
7. ALL EXTERIOR RACEWAYS ABOVE GROUND SHALL BE RIGID GALVANIZED.
8. UNDER NO CIRCUMSTANCES SHALL MORE THAN THREE CIRCUITS SHARE THE SAME NEUTRAL, AND SUCH CIRCUITS MUST BE SEPARATE PHASE.
9. SINCE ELECTRICAL CHARACTERISTIC OF EQUIPMENT (SUCH AS HORSEPOWER, KW, AMPERAGE, VOLTAGE, ETC.) SUBMITTED MAY DIFFER FROM THOSE SPECIFIED IN DRAWINGS, CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH MECHANICAL AND OTHER CONTRACTORS TO ENSURE COMPATIBILITY BETWEEN ELECTRICAL AND MECHANICAL EQUIPMENT SIZES AND TYPES OF ELECTRICAL INTERFACE EQUIPMENT REQUIRED.
10. USE LONG-SWEEPS FOR ALL CHANGES IN DIRECTION ON CONDUIT RUNS.
11. ALL INTERIOR RACEWAYS SHALL BE EMT.
12. FIELD VERIFY PROJECT SITE EXISTING CONDITIONS AND ELEVATIONS PRIOR TO BEGINNING ANY WORK.
13. PHASING AND SEQUENCE OF CONSTRUCTION SHALL BE PER DRAWINGS AND SPECIFICATIONS.
14. ALL MATERIALS AND LABOR, WHETHER SPECIFICALLY INDICATED ON PLANS OR NOT, WHICH ARE NECESSARY FOR THE PROPER INSTALLATION AND FUNCTION OF THE SYSTEM SHALL BE FURNISHED BY THIS CONTRACTOR. INCLUDE ALL COSTS OF CHANGES, IF/AS REQUIRED IN BID PROPOSAL.
15. ELECTRICAL WIRING SHALL NOT BE SPLICED BELOW GRADE.
16. CONTRACTOR IS RESPONSIBLE FOR ALL PERMITS AND FEES ASSOCIATED WITH PROJECT, INCLUDING FEES FOR INSPECTIONS, APPLICATIONS, AND PROVISION OF NEW SERVICES.
17. CONTRACTOR WHO WILL ACTUALLY PERFORM WORK MUST APPLY FOR ALL REQUIRED PERMITS.
18. NOTIFY ENGINEER OF ANY ASPECTS OF DESIGN WHICH ARE THOUGHT TO BE IN NONCOMPLIANCE WITH APPLICABLE CODES.
19. COORDINATE ALL WORK WITH OTHER TRADES; COORDINATE SCHEDULE OF WORK WITH ALL SUB-CONTRACTORS TO ACHIEVE SMOOTH FLOW OF CONSTRUCTION.
20. SEAL AROUND ELECTRICAL RACEWAYS AT ALL WALLS AND WALL LOUVER PENETRATIONS WITH FIREPROOF CAULKING. RE: SPECS. PROVIDE FLASHING AROUND PENETRATION, BOTH INSIDE AND OUTSIDE, TO PROVIDE FINISHED LOOK.
21. CONTRACTOR SHALL REVIEW COMPLETE DOCUMENTS PRIOR TO SUBMITTAL OF PROPOSAL TO GAIN COMPLETE UNDERSTANDING OF PROJECT SCOPE, WORK BY OTHERS, AND ELECTRICAL WORK ASSOCIATED WITH OTHER DISCIPLINES.
22. MAINTAIN MANUFACTURER RECOMMENDED CLEARANCE AROUND ALL EQUIPMENT.
23. AFFIX ID TAGS TO ALL DIVISION 26 EQUIPMENT.
24. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH MECHANICAL AND PLUMBING CONTRACTOR REGARDING EQUIPMENT SIZES AND TYPES OF ELECTRICAL INTERFACE EQUIPMENT REQUIRED.
25. FIELD VERIFY ALL CONDITIONS AND MEASURE DIMENSIONS WITHIN THE BUILDING PRIOR TO ORDERING EQUIPMENT AND/OR PROCEEDING WITH INSTALLATION.
26. ALL EQUIPMENT SHALL BE FACTORY TESTED, AND CONTRACTOR SHALL VERIFY THEIR CONDITION PRIOR TO INSTALLATION. CONTRACTOR IS RESPONSIBLE FOR EQUIPMENT DAMAGED DURING MOVING AND INSTALLATION.
27. EQUIPMENT FOUND DEFECTIVE PRIOR TO FINAL ACCEPTANCE SHALL BE REPLACED AT NO COST TO OWNER.
28. SLEEVE ALL EXTERIOR WALL PENETRATIONS.
29. IN THE EVENT A CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS ARISES, THE GREATER AMOUNT OF TOTAL COST SHALL BE PRICED. CONFLICT SHALL BE PRESENTED TO ENGINEER FOR FURTHER DIRECTION(S).

EQUIPMENT:

1. FIELD VERIFY ALL CONDITIONS AND MEASURE DIMENSIONS WITHIN THE BUILDING PRIOR TO ORDERING EQUIPMENT AND/OR PROCEEDING WITH INSTALLATION.
2. PRIOR TO MOVING PRE-PURCHASED EQUIPMENT FROM OWNER'S DESIGNATED WAREHOUSE/STORAGE TO PROJECT SITE, CONTRACTOR SHALL VERIFY AND DOCUMENT EQUIPMENT CONDITION. CONTRACTOR SHALL IMMEDIATELY REPORT ANY DAMAGES FOUND. WITHOUT SUCH VERIFICATION AND DOCUMENTATION, EQUIPMENT FOUND DEFECTIVE AFTER INSTALLATION SHALL BE REPLACED AT NO COST TO OWNER.
3. EQUIPMENT FOUND DEFECTIVE PRIOR TO FINAL ACCEPTANCE SHALL BE REPLACED AT NO COST TO OWNER.
4. MAINTAIN CLEARANCE AROUND ALL EQUIPMENT AS REQUIRED BY NATIONAL ELECTRIC CODE AND MANUFACTURER RECOMMENDATIONS.
5. PROVIDE SPRING HANGER TYPE VIBRATION ISOLATION DEVICES TO SUPPORT SUSPENDED, POWERED, VIBRATING EQUIPMENT. PROVIDE FLEXIBLE CONNECTORS AS REQUIRED.
6. PROVIDE TRAPPED CONDENSATE DRAIN LINES FROM ALL HVAC EQUIPMENT AND TERMINATE AT NEAREST APPROVED RECEPTORS.
7. COMPLETELY WEATHERPROOF ALL EQUIPMENT, PIPES AND OTHER DEVICES AND MATERIALS INSTALLED OUTSIDE THE BUILDING, IN MECHANICAL YARD, OR OTHERWISE EXPOSED TO WEATHER. AS A MINIMUM, WEATHERPROOFING SHALL INCLUDE, BUT IS NOT LIMITED TO THE FOLLOWING: JACKETING FOR ALL PIPING INSULATION, VALVES AND ACCESSORIES RATED FOR OUTDOOR SERVICE. ELECTRICAL ENCLOSURES NEMA 4X-SS. UNLESS OTHERWISE NOTED.
8. AFFIX ID TAGS TO ALL MECHANICAL EQUIPMENT.
9. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH ELECTRICAL CONTRACTOR REGARDING EQUIPMENT SIZES AND TYPES OF ELECTRICAL INTERFACE EQUIPMENT REQUIRED.
10. PROVIDE MECHANICAL, PLUMBING, AND ELECTRICAL WORK REQUIRED FOR A COMPLETE AND OPERATIONAL INSTALLATION.

DEMOLITION GENERAL NOTES:

1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPE SIZES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS. PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

EXISTING CONDITIONS & COORDINATION/RENOVATION:

1. COORDINATE SCHOOL SCHEDULES, POWER DOWN TIMES, AND PROJECT COMPLETION DATES WITH OWNER. PERFORM WORK IN CLOSE COORDINATION WITH OWNER. MAJORITY OF WORK SHALL BE PERFORMED WHEN SCHOOL IS UNOCCUPIED, SUCH AS WEEKENDS, AFTER HOURS, HOLIDAY BREAKS OR OTHER OWNER APPROVED TIMES.
2. COORDINATE WORK AMONG ALL DISCIPLINES. IT IS NOT THE INTENT OF THESE DOCUMENTS TO DICTATE WHO MUST DO THE WORK. ALL WORK SHOWN IS THE RESPONSIBILITY OF THE (PRIME) CONTRACTOR.
3. PRIOR TO DEMOLITION WORK, SUBMIT A DETAILED DEMOLITION AND CONSTRUCTION SCHEDULE TO OWNER AND ENGINEER. DO NOT PROCEED WITH WORK UNTIL PROPOSED SCHEDULE IS APPROVED BY ALL PARTIES. PROVIDE OWNER WITH MINIMUM 10 DAYS ADVANCE NOTICE OF INTENT TO PERFORM ANY WORK WHICH WILL REQUIRE CHILLER, PLANT OR ELECTRICAL SERVICE TO BE SHUT DOWN.
4. NOTIFY ENGINEER AND OWNER IF TEMPORARY OR PERMANENT RELOCATION OF UTILITIES IS REQUIRED.
5. COORDINATE DEMOLITION WORK WITH NEW AND TEMPORARY CONSTRUCTION WITH MINIMAL INTERRUPTION OF POWER AND OTHER UTILITIES. COORDINATE WITH OWNER AND ENGINEER FOR ANY DISRUPTION IN UTILITY SERVICES, PARTICULARLY THOSE THAT MIGHT AFFECT OCCUPANCY.
6. CONTRACTOR SHALL NOT PROCEED WITH ANY WORK INVOLVING A CHANGE IN PROJECT SCOPE OR COST WITHOUT FIRST HAVING OBTAINED ENGINEER'S APPROVAL IN WRITING. UNLESS ENGINEER HAS AGREED TO SUCH CHANGE PRIOR TO IT BEING DONE, AND HAS AGREED THAT AN INCREASE IN COST ASSOCIATED WITH SUCH CHANGE IS WARRANTED; CONTRACTOR WILL NOT BE REIMBURSED FOR SUCH CHANGE.
7. PROVIDE LIGHTED SAFETY BARRIERS AROUND WORK AREAS AT ALL TIMES.
8. SLEEVE ALL EXTERIOR WALL AND GRADE BEAM PENETRATIONS. GRADE BEAM PENETRATIONS SHALL BE MADE WITHIN MIDDLE 1/3 OF VERTICAL SPAN OF BEAM.
9. SEAL AROUND DUCTS AND PIPES AT WALL PENETRATIONS WITH FIRE PROOF MATERIALS, PROVIDE ESCUTCHEON PLATS AND FLASHING AROUND PENETRATIONS, BOTH INSIDE AND OUTSIDE, TO PROVIDE A FINISHED LOOK.
10. PROVIDE SHOP DRAWINGS TO COORDINATE EXISTING AND NEW WORK.
11. REMOVE ALL EQUIPMENT, MATERIALS, CONTROL DEVICES, BOXES, POWER AND CONTROL WIRING, SAFETY SWITCHES, TUBING, ELECTRICAL CONDUIT, PIPING, SENSORS, ELECTRICAL DISCONNECTS, SUPPORTING DEVICES AND STRUCTURES, AND ALL RELATED AUXILIARY ITEMS ASSOCIATED WITH EQUIPMENT AND MATERIALS WHICH WILL NO LONGER BE USED AFTER THE PROJECT IS COMPLETE. PREPARE HOB SITE FOR NEW CONSTRUCTION.
12. IT IS CONTRACTOR'S RESPONSIBILITY TO REMOVE AND DISPOSE OF ALL ITEMS INDICATED TO BE REMOVED. HOWEVER, OWNER SHALL HAVE FIRST RIGHT OF REFUSAL OF ALL MATERIAL REMOVED. CONTRACTOR SHALL DISPOSE OF ALL MATERIALS WHICH THE OWNER DOES NOT WANT.
13. CONTRACTOR IS RESPONSIBLE FOR RESTORING ANY DISTURBED SURFACE TO ITS ORIGINAL CONDITION. ANY ROAD, TRAFFIC, OR OTHER PAINTED OR ERECTED SIGNS DAMAGED AS A RESULT OF WORK PERFORMED IN THOSE AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION.
14. CUTTING AND PATCHING OF WALLS DAMAGED IN THE REMOVAL OF ITEMS SHALL BE DONE, WHETHER OR NOT DRAWINGS SPECIFICALLY CALL FOR SUCH REPAIRS.
15. MAINTAIN PROJECT SITE FREE OF WASTE MATERIALS AND DEBRIS, AND CLEAN SITE AT END OF EACH WORK DAY TO GREATEST EXTENT POSSIBLE.

CODES, ORDINANCES AND PERMITS:

1. CONTRACTOR IS RESPONSIBLE FOR ALL PERMITS AND FEES ASSOCIATED WITH PROJECT, INCLUDING FEES FOR INSPECTIONS, APPLICATIONS, AND PROVISION OF NEW SERVICES.
2. PERFORM ALL WORK PER APPLICABLE VERSION OF MECHANICAL AND NATIONAL ELECTRICAL CODE, LOCAL CODES AND ORDINANCES, UNLESS DRAWINGS OR SPECIFICATIONS HAVE MORE STRINGENT REQUIREMENTS.
3. NOTIFY ENGINEER OF ANY ASPECTS OF DESIGN WHICH ARE THOUGHT TO BE IN NONCOMPLIANCE WITH APPLICABLE CODES.
4. OBTAIN APPROVAL FROM CITY FIRE DEPARTMENT AND BUILDING AND SAFETY DEPARTMENT PRIOR TO INSTALLATION OF ANY FIRE RELATED ITEMS.
5. COORDINATE PRESSURE TESTS, INSPECTIONS AND APPROVAL FOR ALL SYSTEMS WITH PERMITTING OFFICER, OWNER AND ENGINEER;

GENERAL REQUIREMENTS:

1. SUBMISSION OF PROPOSAL IS CONSIDERED AN ACKNOWLEDGEMENT THAT CONTRACTOR VISITED SITE, VERIFIED ALL EXISTING CONDITIONS, AND INCLUDED ANY MODIFICATIONS TO EXISTING AND NEW WORK REQUIRED FOR INSTALLATION OF A COMPLETE AND OPERATIONAL SYSTEM.
2. TIME OR MONEY ALLOWANCES WILL NOT BE MADE TO ACCOMMODATE CONDITIONS THAT COULD HAVE BEEN VERIFIED PRIOR TO SUBMITTING PROPOSAL, AND AT SHOP DRAWING STAGE.
3. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPE SIZES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR TO ORDERING MATERIALS OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
4. REFER TO SPECIFICATIONS FOR PROJECT COMPLETION DATES. PERFORM WORK IN CLOSE COORDINATION WITH OWNER. MAJORITY OF WORK SHALL BE PERFORMED AT OWNER APPROVED TIME.
5. WORK TO BE DONE UNDER ALLOWANCES BECOMES AN INTEGRAL PART OF THE WORK AND THE RESPONSIBILITY OF THE CONTRACTOR ONCE THE ALLOWANCE IS APPROVED.

CONTROLS:

1. ACL IS RESPONSIBLE FOR ALL PROJECT CONTROL ACTIVITIES FOR THIS PROJECT.
2. CONTRACTOR SHALL COOPERATE AND COORDINATE WORK ACTIVITIES WITH DDC CONTROLS CONTRACTOR TO ENSURE SMOOTH TROUBLE-FREE INSTALLATION. CURRENT CONTROLS BY ACL.
3. WHERE NOT SPECIFICALLY INDICATED ON PLANS, DDC CONTRACTOR IS RESPONSIBLE FOR ALL CONTROL RELAYS AND CONTACTORS, POWER TO DDC PANELS, AND OTHER CONTROL ELEMENTS. ALTHOUGH DDC CONTRACTOR MAY COORDINATE WITH OTHER TRADES TO PROVIDE MISCELLANEOUS ELECTRICAL WORK, THE FINAL RESPONSIBILITY FOR ACHIEVEMENT OF CONTROL SEQUENCES LIES WITH DDC CONTRACTOR.
4. INTEGRATE NEW CONTROLS WITH OWNER'S EXISTING ON-SITE CONTROL SYSTEM. ACL MAINTAINS EXISTING SITE CONTROLS.
5. ALL REFERENCES TO CONTROLLED / MONITORED POINTS AND/OR GRAPHICS WHICH ARE ON A CURRENT CONTROL SYSTEM, AND WHICH WILL BE REMOVED DURING COURSE OF CONSTRUCTION OF THIS PROJECT, MUST BE COMPLETELY REMOVED FROM CONTROL SYSTEM SOFTWARE. CONTROL SYSTEM WIRING AND CONTROLLERS TO SUCH POINTS MUST BE REMOVED AS WELL.
6. AUTOMATED LOGIC SHALL SERVE AS THE DDC CONTRACTOR. DDC CONTRACTOR SHALL REMOVE EXISTING DEVICES, STORE THEM, AND RETURN ALL NON-REUSED DEVICES TO THE OWNER.

SPARE MATERIALS

1. PROVIDE ADDITIONAL MATERIALS DESCRIBED BELOW THAT MATCH PRODUCTS INSTALLED & THAT ARE PACKAGED WITH A PROTECTIVE COVERING FOR STORAGE & IDENTIFIED WITH LABELS DESCRIBING THE CONTENTS. INCLUDE THE INSTALLATION COST IN BASE BID PROPOSAL.
   - A. 50 LINEAR FEET - 3/4" - 3#10 & #10G
   - B. 50 LINEAR FEET - 3/4" - 3#8 & #10G
   - C. 50 LINEAR FEET - 1.25" - 3#2 & #8G
   - D. 50 LINEAR FEET - 1/2" - 3#12 & #12G
   - E. 50 LINEAR FEET - 1" - 3#4 & #10G

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STISD HVAC Project 26-27
MERCEDES, OLMITO, & EDINBURG, TEXAS

STATE OF TEXAS
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07.31.2026

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Architects-Planners
Interior Designers

Date: 07/31/2026
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: FJR
Job No.: 25V131
Sheet: ME2.00

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2 EXISTING PANEL "HVB" IMAGE

SCALE : NOT TO SCALE



3 EXISTING NOTIFIER FACP IMAGE

SCALE : NOT TO SCALE



1 STISD Health Professions - Demo Mechanical & Electrical Floor Plan

SCALE: 1/4" = 1'-0"

NORTH

DEMOLITION GENERAL NOTES:

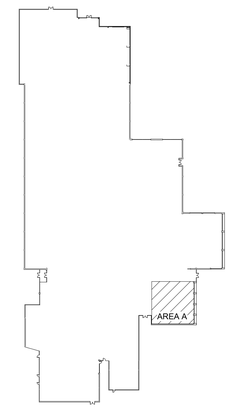
1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

MECHANICAL DEMOLITION KEYED NOTES:

1. DEMOLISH EXISTING INDOOR DX AIR HANDLING UNIT (AHU) AND ASSOCIATED THERMOSTAT, AND ACCESSORIES THAT WILL NO LONGER BE USED. REFER TO ELECTRICAL DRAWINGS FOR WORK RELATED TO DISCONNECTS, CONDUITS, WIRING, ETC.
2. DEMOLISH EXISTING REFRIGERANT LINES AND ACCESSORIES.
3. DEMOLISH EXISTING AIR COOLED CONDENSING UNIT (ACCU) AND ASSOCIATED ACCESSORIES. SUPPORT ASSEMBLIES ETC. RETAIN PADS FOR REUSE. REFER TO ELECTRICAL DRAWINGS FOR WORK RELATED TO DISCONNECTS, CONDUITS, WIRING, ETC. FIELD VERIFY EXACT LOCATIONS.
4. EXISTING HVAC EQUIPMENT TO REMAIN.
5. DEMOLISH EXISTING DUCTWORK AS SHOWN.
6. REMOVE AND DISPOSE OF EXISTING DUCT HEATER AND ALL ASSOCIATED COMPONENTS. PATCH AND MODIFY EXISTING DUCTWORK AS REQUIRED WITH NEW DUCTWORK TO MATCH EXISTING DIMENSIONS AND MAINTAIN PROPER AIRFLOW AND SYSTEM INTEGRITY.
7. DEMOLISH EXISTING DUCTWORK AS NECESSARY TO ACCOMMODATE INSTALLATION OF NEW AHU.
8. EXISTING OUTSIDE AIR LOUVER TO REMAIN. PROTECT DURING ALL PHASES OF CONSTRUCTIONS.
9. DEMOLISH EXISTING THERMOSTAT

ELECTRICAL DEMOLITION KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING EXISTING HVAC EQUIPMENT.
2. DISCONNECT EXISTING HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. DEPROGRAM AND TEMPORARILY DISCONNECT EXISTING DUCT SMOKE DETECTOR.
4. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.
5. DISCONNECT AND REMOVE EXISTING DUCT HEATER WITH RELATED WIRING, RACEWAY, AND SAFETY SWITCH, ALL THE WAY TO THE POWER SOURCE.



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(PRE-PURCHASED) ACCU SCHEDULE - STISD MERCEDES - PRINCIPAL OFFICES

MARK	SERVING	TOTAL	COND	ELECTRICAL	EER / IEER	STEPS OF	FANS	(CIRCUIT)		WEIGHT	NOTES	MANUFACTURER	MODEL NUMBER
		BTUH	DB	V-PH-HZ	AT ARI	CAPACITY	HP	MCA	MOCP	(LBS.)			
ACCU-1	AHU-14	97	98	460/3/60	11/14.1	2	2	17	25	425	ALL	LENNOX	EL090KPSST-460

NOTES:

1. ACCU'S HAVE BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS. PROVIDE ITEMS BELOW AS PART OF THE INSTALLATION SCOPE OF WORK.
2. INSTALL OWNER PROVIDED LOUVER HAIL GUARD.
3. PROVIDE LOW AMBIENT KIT, SIGHT GLASS, SERVICE VALVES, FILTER DRYER, SOLENOID VALVES, TXVS, ANTI-SHORT CYCLE TIMER.
4. PROVIDE FREEZESTAT/DEFROST CONTROLLER TO PROTECT COMPRESSOR(S) WHEN ICE BUILD-UP IS DETECTED IN THE EVAPORATOR COIL.
5. SAFETY DISCONNECT TO BE PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
6. PROVIDE REFRIGERANT PIPING, AS PER SPECIFICATIONS AND AS PER EQUIPMENT SUBMITTAL SIZING GUIDELINES. PROVIDE INSULATION AND ALUMINUM METAL JACKETING AROUND INSULATION FOR ALL EXTERIOR EXPOSED LINES.
7. BOLT DOWN CONDENSING UNIT ON PAD.

(PRE-PURCHASED) HEAT PUMP AIR HANDLER UNIT SCHEDULE - STISD MERCEDES - PRINCIPAL OFFICES

MARK	UNIT TYPE	TOTAL CFM	OUTSIDE AIR CFM	ESP IN WG	FAN TYPE	EX. MIN MOTOR HP	MAX MOTOR bHP	ELECTRICAL V-PH-HZ	COOLING TOTAL BTUH	COOLING SENS. BTUH	COOLING EAT DB/WB (F)	COOLING LAT DB/WB (F)	HEATER SECTION HEAT KW	HEAT CFM	ELECT. V-PH-HZ	STAGES	MCA	MOCP	WEIGHT (LBS.)	NOTES	MANUFACTURER	MODEL NUMBER
AHU-14	VERTICAL DX SPLIT	3,600	360	0.8	BELT	2	4	460/3/60	97	87	78/65	54.8/54.8	10	3600	460/3/60	2	20	25	431	ALL	LENNOX	EL090KASD-STD-460

NOTES:

1. AIR HANDLER HAS BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS. PROVIDE ITEMS BELOW AS PART OF THE INSTALLATION SCOPE OF WORK.
2. SAFETY DISCONNECT PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.

EQUIPMENT CONNECTION SCHEDULE - STISD MERCEDES - PRINCIPAL OFFICES

DESIGN	NEW MCA	EXISTING MOCP	NEW MOCP	VOLTAGE	EXISTING MEANS OF DISCONNECT	NEW MEANS OF DISCONNECT	EXISTING BRANCH CIRCUIT	NEW BRANCH CIRCUIT 60°C (COPPER)	EXISTING POWER SOURCE
ACCU-1	17	50	1) 25	480V/3-PHASE	REMOVE EXISTING	30A, 3P3F, 25AF, 600V, NEMA 3R	1" - 3#8 & #10G	RETAIN EXISTING	HVB
AHU-14	20	15	2) 25	480V/3-PHASE	REMOVE EXISTING	30A, 3PNF, 600V, NEMA 1	REMOVE EXISTING	3/4" - 3#10 & #10G	HVB

GENERAL NOTES:

A. LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL BELOW DUCTWORK OR PLUMBING LINES.

B. PROVIDE NEW BRANCH CONNECTION FROM DISCONNECT TO EQUIPMENT. TYPICAL FOR ALL NEW HVAC EQUIPMENT.

NOTES:

1) RETAIN AND REUSE EXISTING CIRCUIT BREAKER.

2) REMOVE EXISTING CIRCUIT BREAKER AND PROVIDE NEW TO MATCH NEW MOCP. PROVIDE ALL UL LISTED UNIT FROM EXISTING MANUFACTURER (SQUARE "D"). MATCH EXISTING KAIC.

PANELBOARD "HVB" (EXISTING): SQUARE "D" TYPE NEHB, 225A, 277/480V, 3Ø, 4W.



1 STISD Health Professions - Mechanical & Electrical Floor Plan

SCALE: 1/4" = 1'-0"

NORTH

MECHANICAL GENERAL NOTES:

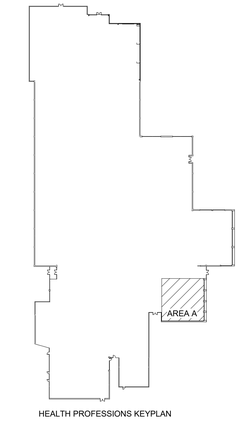
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, COMPONENTS, AND CEILING DEVICES TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. RECONNECT TO EXISTING DUCTWORK, UNLESS NOTED OTHERWISE.
2. INSTALL OWNER'S PRE-PURCHASED AIR HANDLER UNIT (AHU) IN MECHANICAL ROOM AND ITS ASSOCIATED ACCESSORIES. PROVIDE WATER LEVEL DETECTION DEVICE THAT WILL SHUT-OFF THE AHU PRIOR TO OVERFLOW. REFER TO DETAILS SHEET. TO EXTENT POSSIBLE, REUSE AND RECONNECT TO EXISTING DUCTWORK.
3. PROVIDE NEW REFRIGERANT PIPING IN THE SAME LOCATION AS EXISTING, INSULATED AND JACKETED AS SPECIFIED. SLEEVE ALL PENETRATION AND SEAL AIR TIGHT AROUND PIPE PENETRATIONS WITH FIRE-PROOF CAULKING. PROVIDE ESCUTCHEON PLATES AND FLASHING AROUND PENETRATIONS, BOTH INSIDE AND OUTSIDE TO PROVIDE A FINISHED LOOK. PROVIDE REFRIGERANT LINE SUPPORTS PER DETAILS AND SPECIFICATIONS.
4. INSTALL OWNER'S PRE-PURCHASED CONDENSING UNIT AND ITS ASSOCIATED ACCESSORIES. BOLT AND SECURE UNIT DOWN TO EXISTING CONCRETE PAD.
5. RE-BALANCE NEW AHU AIR DIFFUSERS TO MATCH THE CFM SHOWN ON THE SCHEDULE . COORDINATE WITH TAB CONTRACTOR.
6. PROVIDE NEW DUCTWORK CONNECTIONS BETWEEN THE NEW AHU AND THE EXISTING DUCTWORK TO CREATE A FULLY OPERATIONAL SYSTEM AS SCHEDULED.
7. PROVIDE NEW ALC THERMOSTAT THAT IS COMPATIBLE WITH EXISTING BUILDING AUTOMATION SYSTEM (BAS). COORDINATE ALL REQUIRED HARDWARE, SOFTWARE, PROGRAMMING, AND COMMISSIONING WITH THE BAS CONTRACTOR. MOUNT THERMOSTAT 4' A.F.F.
8. PROVIDE NEW DUCTWORK CONNECTIONS BETWEEN THE EXISTING DUCTWORK AND NEW DUCTWORK TO CREATE A FULLY OPERATIONAL SYSTEM.
9. EXISTING OA LOUVER AND IT DUCTWORK TO REMAIN. PROTECT DURING ALL PHASES OF CONSTRUCTION.

ELECTRICAL KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING NEW HVAC EQUIPMENT.
2. CONNECT NEW HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. REPROGRAM AND RECONNECT EXISTING DUCT SMOKE DETECTOR.
4. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.



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LICENSED PROFESSIONAL ENGINEER
07.31.2026

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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

Date: 07/31/2026
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: FJR
Job No.: 25V131
Sheet: ME3.02

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1 STISD Medical Professions - Demo Mechanical & Electrical Floor Plan

SCALE: 1/4" = 1'-0"

NORTH

DEMOLITION GENERAL NOTES:

1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

MECHANICAL DEMOLITION KEYED NOTES:

1. DEMOLISH EXISTING DUCTWORK AS SHOWN. REFER TO NEW PLAN FOR NEW DUCTWORK ROUTING.
2. DEMOLISH EXISTING DX AIR HANDLING UNIT, ASSOCIATED DUCTWORK, AND PLATFORM THAT WILL NO LONGER BE USED.
3. DEMOLISH EXISTING CONDENSING UNIT, PIPING AND CURB THAT WILL NO LONGER BE USED.
4. EXISTING ALC THERMOSTAT SENSOR TO REMAIN.
5. EXISTING FIRE DAMPERS TO REMAIN. PROTECT DURING ALL PHASES OF CONSTRUCTION.
6. EXISTING DIFFUSER/GRILLE AND ASSOCIATED DUCTWORK IS EXISTING TO REMAIN. PROTECT DURING ALL STAGES OF CONSTRUCTION.

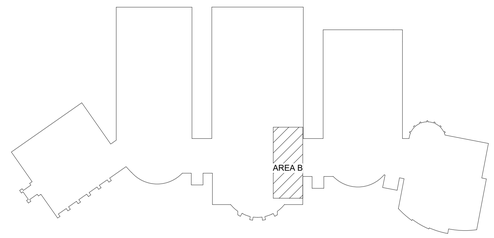
ELECTRICAL DEMOLITION KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING EXISTING HVAC EQUIPMENT.
2. DISCONNECT EXISTING HVAC EQUIPMENT FOR REPLACEMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.



2 EXISTING NOTIFIER FACP IMAGE

SCALE : NOT TO SCALE



MEDICAL ACAD. KEYPLAN

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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

STATE OF TEXAS
CESAR A. GONZALEZ
108611
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(PRE-PURCHASED)AIR HANDLING UNIT SCHEDULE STISD OLMITO - IDF ROOM

MARK	SERVES	UNIT TYPE	TOTAL CFM	OUTSIDE AIR CFM	ESP IN WG	FAN TYPE	EX. MIN MOTOR HP	MAX MOTOR bHP	ELECTRICAL V-PH-HZ	COOLING TOTAL MBTUH	COOLING SENS. MBTUH	COOLING EAT DB/WB (F)	COOLING LAT DB/WB (F)	WEIGHT (LBS.)	NOTES	MANUFACTURER	MODEL NUMBER
AHU-1	IDF B112	VERTICAL DX SPLIT	2,030	-	0.5	ECM	1	4	208-1-60	57.7	45.8	75.0/62.5	55.3/43.4	190	ALL	LENNOX	CBK45UHVT-060

NOTES:

1. AIR HANDLER HAS BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS. PROVIDE ITEMS BELOW AS PART OF THE INSTALLATION SCOPE OF WORK.
2. SAFETY DISCONNECT PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
3. REFER TO SEQUENCES OF OPERATION FOR CONTROLS SCOPE OF WORK.
4. PROVIDE ACTUATORS FOR RA AND OA DAMPERS. COORDINATE WITH CONTROLS CONTRACTOR.
5. CONTRACTOR TO INSTALL AND WIRE OWNER PROVIDED VFD.

EQUIPMENT CONNECTION SCHEDULE - STISD OLMITO - IDF ROOM

DESIGN	NEW MCA	EXISTING MOCP	NEW MOCP	VOLTAGE	EXISTING MEANS OF DISCONNECT	NEW MEANS OF DISCONNECT	EXISTING BRANCH CIRCUIT	NEW BRANCH CIRCUIT 60°C (COPPER)	EXISTING POWER SOURCE	NEW POWER SOURCE
AHU-1	8	2) 20	1) 15	208V/1-PHASE	REMOVE EXISTING	30A, 3PNF, 240V, NEMA 1	REMOVE EXISTING	1/2" - 2#12 & #12G	EH1	MDF
ACCU-1	23	2) 15	1) 40	208V/3-PHASE	REMOVE EXISTING	60A, 3PNF, 240V, NEMA 4XSS	REMOVE EXISTING	3/4" - 3#8 & 10G	EH1	MDF

GENERAL NOTES:

A. LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL BELOW DUCTWORK OR PLUMBING LINES.

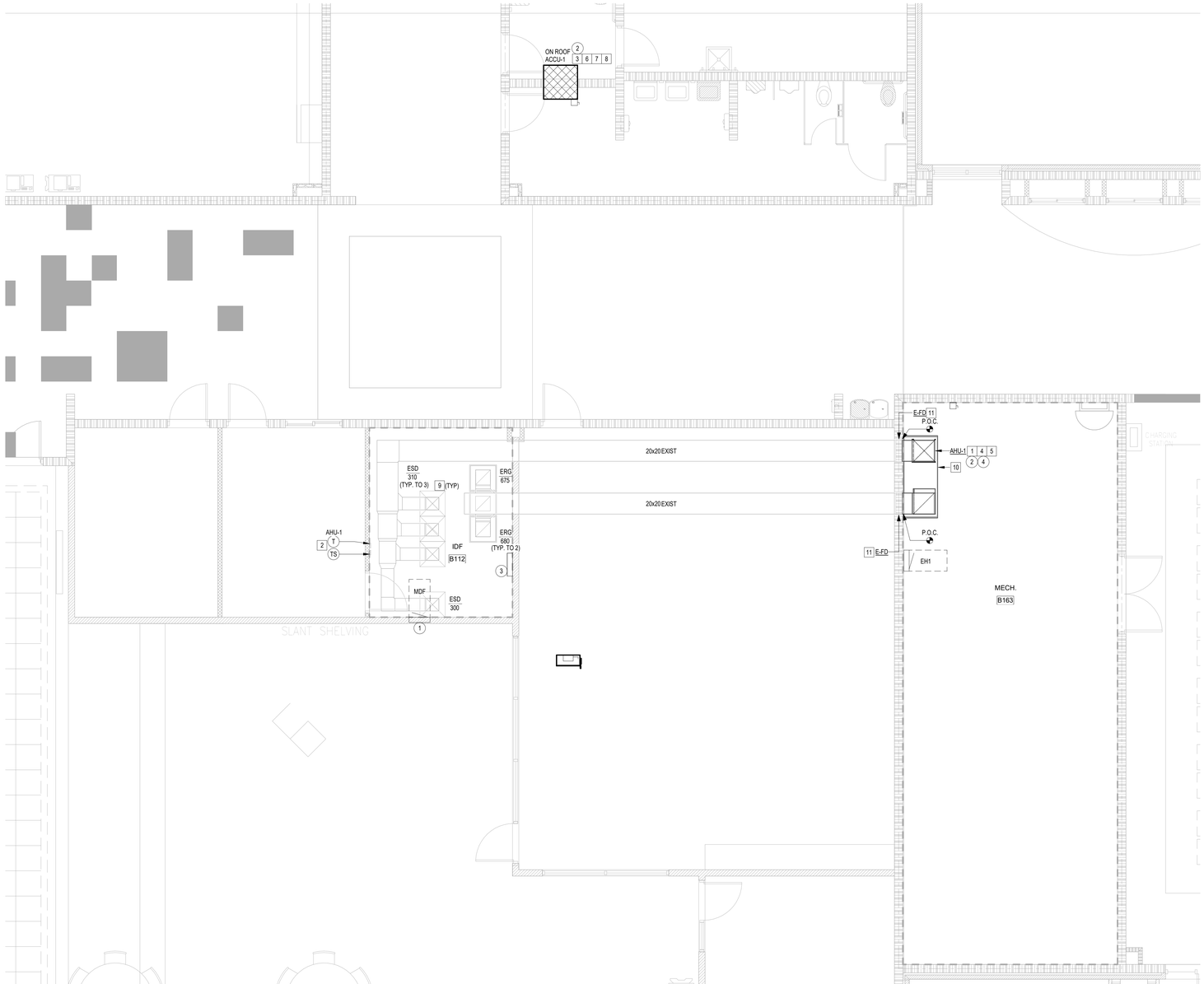
B. PROVIDE NEW BRANCH CONNECTION FROM DISCONNECT TO EQUIPMENT. TYPICAL FOR ALL NEW HVAC EQUIPMENT.

NOTES:

1) PROVIDE NEW CRICUIT BREAKER TO MATCH NEW MOCP IN NEW POWER SOURCE PANELBOARD. PROVIDE ALL UL LISTED UNIT FROM EXISTING MANUFACTURER (EATON). MATCH EXISTING KAIC.

2) EXISTING CIRCUIT BREAKER TO REMAIN AS SPARE.

PANELBOARD "MDF" (EXISTING): EATON POW-R-LINE 1A, 225A, 208Y/120V, 3Ø, 4W, 10KAIC



(PRE-PURCHASED) ACCU SCHEDULE - STISD OLMITO - IDF ROOM

MARK	SERVING	TOTAL MBTUH	COND DB	ELECTRICAL V-PH-HZ	SEER2 / EER2	STEPS OF CAPACITY	FANS HP	(CIRCUIT) MCA	(CIRCUIT) MOCP	WEIGHT (LBS.)	NOTES	MANUFACTURER	MODEL NUMBER
ACCU-1	AHU-1	57.7	95	208-3-60	14.7/11.2	2	1	23	40	446	ALL	LENNOX	ML17KC2-060-233

NOTES:

1. ACCU'S HAVE BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS. PROVIDE ITEMS BELOW AS PART OF THE INSTALLATION SCOPE OF WORK.
2. INSTALL OWNER PROVIDED LOUVER HAIL GUARD.
3. PROVIDE LOW AMBIENT KIT, SIGHT GLASS, SERVICE VALVES, FILTER DRYER, SOLENOID VALVES, TXVS, ANTI-SHORT CYCLE TIMER.
4. PROVIDE FREEZESTAT/DEFROST CONTROLLER TO PROTECT COMPRESSOR(S) WHEN ICE BUILD-UP IS DETECTED IN THE EVAPORATOR COIL.
5. SAFETY DISCONNECT TO BE PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
6. PROVIDE REFRIGERANT PIPING, INCLUDING EDA PIPING KIT, AS PER SPECIFICATIONS AND AS PER EQUIPMENT SUBMITTAL SIZING GUIDELINES. PROVIDE INSULATION AND ALUMINUM METAL JACKETING AROUND INSULATION FOR ALL EXTERIOR EXPOSED LINES.
7. BOLT DOWN CONDENSING UNIT ON PAD.

MECHANICAL GENERAL NOTES:

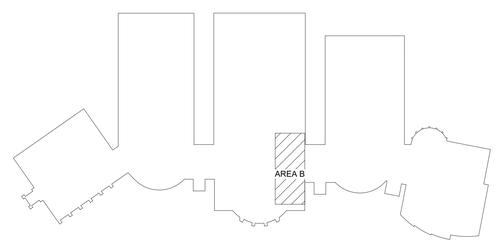
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, COMPONENTS, AND CEILING DEVICES TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. PROVIDE FAN COIL UNIT AS SCHEDULED. PROVIDE WATER LEVEL DETECTION DEVICE THAT WILL SHUT-OFF THE FCU PRIOR TO OVERFLOW. AUXILIARY DRAIN SYSTEM SHALL BE AS PER IMC-2021 SECTION 307.2.3. SEE DETAIL SHEET. DROP REFRIGERANT LINES NEXT TO UNIT TO AVOID INTERFERENCE WITH MAINTENANCE ACCESS. POSITION UNIT TO ALLOW REQUIRED CLEARANCES.
2. EXISTING ALC TEMPERATURE SENSOR TO REMAIN PROVIDE NEW THERMOSTAT FOR NEW AHU-1. MOUNT 48" A.F.F.
3. PROVIDE ROOF MOUNTED AIR COOLED CONDENSING UNIT AND INSULATED REFRIGERANT PIPING PER SCHEDULE AND SPECIFICATIONS. MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCES AND PROVIDE ROOF CURB PER DETAIL. ATTACHMENT SHALL BE CAPABLE OF WITHSTANDING THE LOCAL WIND PRESSURES.
4. PROVIDE FCU PLATFORM USING 3" X 3" X 1/4" GALVANIZED STEEL ANGLE IRON WITH WELDED JOINTS. ENCLOSE PLATFORM USING 1" THICK MOISTURE RESISTANT PLYWOOD AND BOLT TO BRACKET WITH 1/4" GALVANIZED BOLTS. COORDINATE PLATFORM SIZE ON SITE. SET UNIT ON 1/2" NEOPRENE PAD ON PLATFORM. PLATFORM TO BE USED AS A RETURN AIR PLENUM AND BE SEALED AIRTIGHT.
5. ROUTE TRAPPED COPPER CONDENSATE PIPING TO EXISTING FLOOR DRAIN. CLEAN FLOOR DRAIN AS NECESSARY FOR AN UNOBSTRUCTED FLOW.
6. ROUTE REFRIGERANT PIPING TO INDOOR UNIT. COORDINATE ROUTING WITH OTHER TRADES PRIOR TO INSTALLATION. SLEEVE ROOF PENETRATION. SEAL AIRTIGHT AROUND PIPE PENETRATION.
7. PROVIDE REFRIGERANT LINE SUPPORTS. SEE ASSOCIATED DETAIL.
8. PROVIDE 1" INSULATION & PROTECTIVE ALUMINUM JACKETING ON EXPOSED REFRIGERANT LINES. SEE SPECIFICATIONS.
9. EXISTING DIFFUSER/GRILLE AND ASSOCIATED DUCTWORK IS EXISTING TO REMAIN. PROTECT DURING ALL STAGES OF CONSTRUCTION. CONTRACTOR TO RE-BALANCE EXISTING DIFFUSER TO NEW CFM.
10. PROVIDE NECESSARY TRANSITIONS, DUCTWORK AND CONNECTIONS FROM NEW FAN COIL UNIT TO EXISTING DUCTWORK CONNECTIONS.
11. EXISTING FIRE DAMPERS TO REMAIN. PROTECT DURING ALL PHASES OF CONSTRUCTION.

ELECTRICAL KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING NEW HVAC EQUIPMENT.
2. CONNECT NEW HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.
4. PROVIDE NEW DUCT SMOKE DETECTOR.



MEDICAL ACAD. KEYPLAN

1 STISD Medical Professions - Mechanical & Electrical Floor Plan
SCALE: 1/4" = 1'-0"

NORTH

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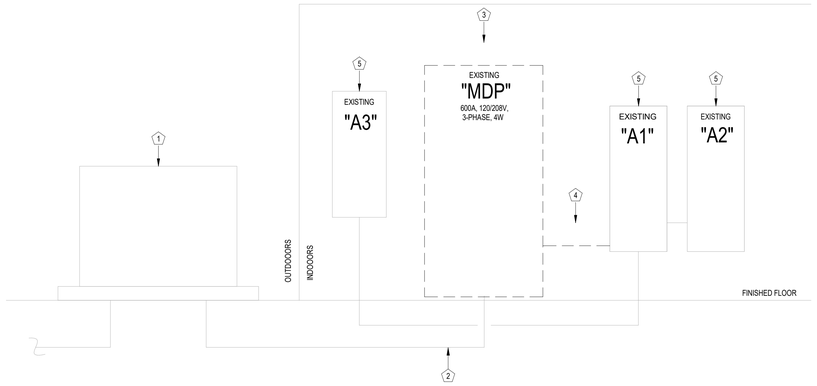
2 EXISTING PANELBOARD "MDP" IMAGE
SCALE : NOT TO SCALE



3 EXISTING NOTIFIER FACP IMAGE
SCALE : NOT TO SCALE

ELECTRICAL RISER DIAGRAM KEYED NOTES

1. EXISTING ELECTRICAL UTILITY PAD MOUNT TRANSFORMER TO REMAIN.
2. EXISTING (2-RUNS EACH) 3" - 4#350KCMIL & #10G. TEMPORARILY DISCONNECT.
3. DISCONNECT AND REMOVE EXISTING PANELBOARD ALONG WITH RELATED SUPPORT HARDWARE.
4. DISCONNECT AND REMOVE EXISTING FEEDER ALONG WITH RELATED RACEWAY AND SUPPORT HARDWARE.
5. EXISTING PANELBOARD TO REMAIN AS IS.



4 DEMOLITION ELECTRICAL RISER DIAGRAM
SCALE : NOT TO SCALE



1 STISD Edinburg - Albert H. Demo Mechanical & Electrical Floor Plan
SCALE: 1/8" = 1'-0"
NORTH

DEMOLITION GENERAL NOTES:

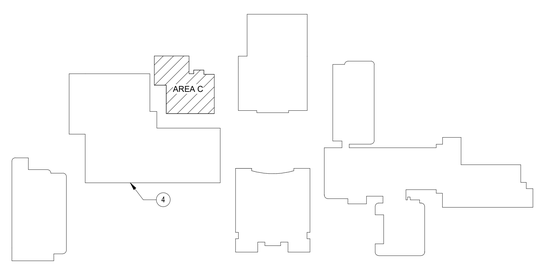
1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPE SIZES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

MECHANICAL DEMOLITION KEYED NOTES:

1. DEMOLISH EXISTING DX PACKAGED ROOF TOP UNIT (RTU) AND ASSOCIATED CURB, CURB ADAPTER AND CONTROLS WIRING INCLUDING THERMOSTAT. REFER TO ELECTRICAL NOTES FOR WORK RELATED TO DISCONNECTS, CONDUITS, WIRING, ETC.
2. DEMOLISH EXISTING DUCTWORK, TRANSITIONS, FITTINGS AND FLEX CONNECTORS UNDERNEATH THE EXISTING RTU AS NECCESARY TO ACCOMMODATE NEW UNIT.
3. DEMOLISH EXISTING DX PACKAGED ROOF TOP UNIT (RTU) AND ASSOCIATED CURB, CURB ADAPTER AND CONTROLS WIRING INCLUDING THERMOSTAT. CONTRACTOR SHALL PATCH, CAP, AND FULLY RESTORE ROOF PENETRATIONS AND ROOFING SYSTEM TO ORIGINAL OR BETTER CONDITION.

ELECTRICAL DEMOLITION KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING EXISTING HVAC EQUIPMENT.
2. DISCONNECT EXISTING HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. DEPROGRAM AND TEMPORALLY DISCONNECT EXISTING DUCT SMOKE DETECTOR.
4. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL REFER TO KEYPLAN. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.
5. DISCONNECT AND REMOVE EXISTING HVAC EQUIPMENT ALONG WITH RELATED WIRING, RACEWAY AND SUPPORT HARDWARE ALL THE WAY BACK TO POWER SOURCE.



EDINBURG KEYPLAN

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(PRE-PURCHASED) EDINBURG STISD DX ROOF TOP UNIT SCHEDULE

MARK	NOMINAL TONS	SERVERS	SUPPLY CFM	OA CFM	ESP (INCHES)	MIN HP	MCA A	MOCP A	ELECTRICAL V-PH-HZ	AIR ON COND.	COOLING				HEATING		CONVENIENCE OUTLETS	MIN. IEER/EER	WEIGHT (LBS.)	NOTES	MANUFACTURER	MODEL NUMBER
											TOTAL	SENSIBLE	EAT	LAT	KW	STG.						
											BTUH	BTUH	DB/WB	DB/WB								
RTU-1-D	3	ALBERT HUGHES	1140	150	1	0.75	29.7	40	208-3-60	100	33,746	25,691	78/65	57.50/55.20	5	1	FACTORY INSTALLED & UNIT POWERED	14.0/12.0	684	ALL	DAIKIN	DSC036
RTU-2-D	7.5	ALBERT HUGHES	3250	415	1	2.4	88.2	90	208-3-60	100	87,900	70,648	78/65	58.2/56.10	30	2	FACTORY INSTALLED & UNIT POWERED	16.0/12.0	1215	ALL	DAIKIN	DSC090
RTU-3-D	7.5	ALBERT HUGHES	3250	200	1	2.4	88.2	90	208-3-60	100	87,900	70,648	78/65	58.2/56.10	30	2	FACTORY INSTALLED & UNIT POWERED	16.0/12.0	1215	ALL	DAIKIN	DSC090
RTU-4-D	7.5	ALBERT HUGHES	3250	150	1	2.4	88.2	90	208-3-60	100	87,900	70,648	78/65	58.2/56.10	30	2	FACTORY INSTALLED & UNIT POWERED	16.0/12.0	1215	ALL	DAIKIN	DSC090

NOTES:

1. ACCU'S HAVE BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS.
2. INSTALL OWNER PROVIDED CONDENSOR HAIL GUARD.
3. PROVIDE MULTI STAGE AIR VOLUME TO MATCH COMPRESSOR UNLOADING. PROVIDE 2 STAGE COMPRESSOR OR A 2 CIRCUIT SYSTEM.
4. PROVIDE MOTORIZED OA DAMPER, CONTROLLER, UL LEAKAGE DAMPERS, DEMAND CONTROL VENTILATION, AND NO BAROMETRIC RELIEF DAMPERS ANYWHERE.
5. INSTALL PRE PURCHASED THERMOSTAT.
6. PROVIDE IBC 2021 COMPLIANT 24" NEW ROOF CURB AND ATTACHMENTS FROM UNIT TO CURB AND CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
   1) ATTACHMENT OF EQUIPMENT TO CURB.
   2) CURB TO STRUCTURE.
   3) CURB AND ATTACHMENT HARDWARE STRENGTH.
   REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS.
   EQUIPMENT OR CURB MANUFACTURER IS ALSO RESPONSIBLE FOR PROVIDING ENGINEERED INSTALLATION DRAWINGS FOR ITEMS 1 AND 2 LISTED ABOVE.
   BOTH, THE ENGINEERED ANALYSIS AND THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING AND PROJECT SITE AND STAMPED AND SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.

EQUIPMENT CONNECTION SCHEDULE

DESIGN	NEW MCA	EXISTING MOCP	NEW MOCP	VOLTAGE	EXISTING MEANS OF DISCONNECT	NEW MEANS OF DISCONNECT	EXISTING BRANCH CIRCUIT	NEW BRANCH CIRCUIT 60°C (COPPER)	EXISTING POWER SOURCE	NEW POWER SOURCE
RTU-1D	29.7	60	40	208V/3-PHASE	REMOVE EXISTING	60A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	3/4" - 3#8 & 10G	MDP	MDP
RTU-2D	88.2	30	90	208V/3-PHASE	REMOVE EXISTING	100A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	1.25" - 3#2 & #8G	MDP	MDP
RTU-3D	88.2	80	90	208V/3-PHASE	REMOVE EXISTING	100A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	1.25" - 3#2 & #8G	MDP	MDP
RTU-4D	88.2	60	90	208V/3-PHASE	REMOVE EXISTING	100A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	1.25" - 3#2 & #8G	MDP	MDP

GENERAL NOTES:

A. LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL BELOW DUCTWORK OR PLUMBING LINES.

B. PROVIDE NEW BRANCH CONNECTION FROM DISCONNECT TO EQUIPMENT. TYPICAL FOR ALL NEW HVAC EQUIPMENT.

Branch Panel: MDP

Location: ELECTRICAL ROOM
Supply From: UILITY
Mounting: SURFACE
Enclosure: Nema 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 65,000
Mains Type: C.B.
Mains Rating: 600 A
MCB Rating: 600 A

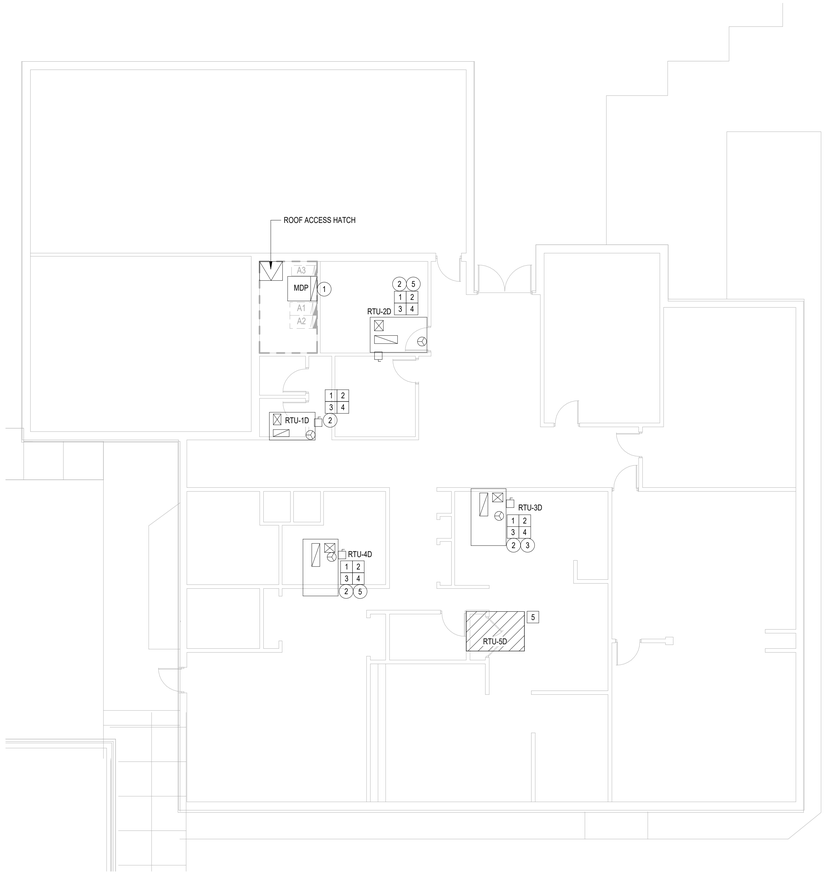
Notes:

CKT	Load Classification Abbreviation	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	Load Classification Abbreviation	CKT
1	HTG; MTRS	RTU-1D	40 A	3	2350 VA	10960 VA					3	90 A	RTU-2D	HTG; MTRS	2
3	--	--	--	--			2350 VA	10960...			--	--	--	--	4
5	--	--	--	--					2350 VA	10960 VA	--	--	--	--	6
7	HTG; MTRS	RTU-3D	90 A	3	10960 VA	10960 VA					3	90 A	RTU-4D	HTG; MTRS	8
9	--	--	--	--			10960...	10960...			--	--	--	--	10
11	--	--	--	--					10960 VA	10960 VA	--	--	--	--	12
13	DIV	PANELS A1, A2	300 A	3	21700 VA	0 VA					3	20 A	SPARE	--	14
15	--	--	--	--			21700...	0 VA			--	--	--	--	16
17	--	--	--	--					21700 VA	0 VA	--	--	--	--	18
19	--	SPARE	60 A	3	0 VA	0 VA					3	30 A	SPARE	--	20
21	--	--	--	--			0 VA	0 VA			--	--	--	--	22
23	--	--	--	--					0 VA	0 VA	--	--	--	--	24
		Total Load:			56930 VA		56930 VA		56930 VA						
		Total Amps:			474 A		474 A		474 A						

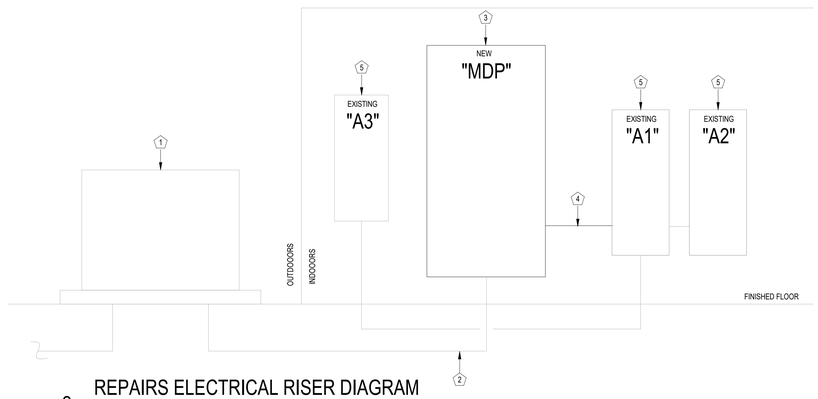
Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HEATING (HTG)	95000 VA	100.00%	95000 VA		
MOTORS (MTRS)	10690 VA	106.74%	11410 VA	**Total Conn. Load:**	170790 VA
DIVERSE (DIV)	65100 VA	100.00%	65100 VA	**Total Est. Demand:**	171510 VA
				Total Conn.:	474 A
				Total Est. Demand:	476 A

Notes:
1. PROVIDE SERVICE ENTRANCE RATED.
2. PROVIDE ALL RTU CIRCUIT BREAKER HACR TYPE.
3. PROVIDE TAYLOR PHASE GUARD PROTECTION TO PANEL "RTU" CIRCUIT BREAKERS.



1 STISD Edinburg - Albert H. Mechanical & Electrical Floor Plan
SCALE: 1/8" = 1'-0"



2 REPAIRS ELECTRICAL RISER DIAGRAM
SCALE : NOT TO SCALE

ELECTRICAL RISER DIAGRAM KEYED NOTES

1. EXISTING ELECTRICAL UTILITY PAD MOUNT TRANSFORMER TO REMAIN.
2. RECONNECT EXISTING FEEDER. IF EXISTING FEEDER DOES NOT REACH NEW POINT OF CONNECTION PROVIDE A WIRING GUTTER TO SPLICE AND EXTEND EXISTING FEEDERS. PROVIDE POLARIS CONNECTORS.
3. PROVIDE NEW PANELBOARD, SEE PANEL SCHEDULE.
4. PROVIDE 3" - 4#350KCMIL & #4G.
5. EXISTING PANELBOARD TO REMAIN AS IS.

MECHANICAL GENERAL NOTES:

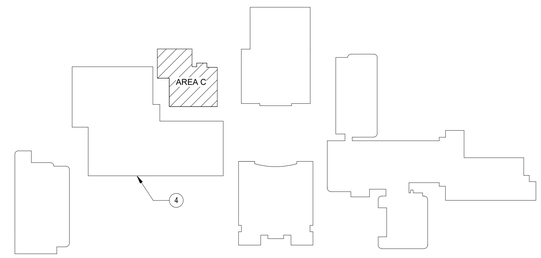
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, COMPONENTS, AND CEILING DEVICES TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. INSTALL OWNER'S PRE-PURCHASED DX RTU. DISCONNECT EXISTING CONTROLS AND REPLACE WITH NEW CONTROLS. PROVIDE NEW 24" ROOFTOP CURB AS PER SPECIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE ROOF CURB TO INSTALL EQUIPMENT ON ROOF. SECURE EQUIPMENT TO ROOF CURB AND ROOF CURB TO ROOF STRUCTURE AS PER DIV. 7 SPECIFICATIONS. ATTACHMENTS SHALL BE CAPABLE OF WITHSTANDING THE LOCAL WIND PRESSURES.
2. RECONNECT TO EXISTING DUCTWORK, UNLESS OTHERWISE NOTED.
3. PROVIDE NEW COPPER CONDENSATE DRAIN LINES WITH P-TRAPS TO NEW UNIT AND EXTEND THEM TO EXISTING DRAIN RECEPTOR.
4. PROVIDE NEW THERMOSTAT IN EXISTING THERMOSTAT LOCATIONS. COORDINATE WITH CONTROLS CONTRACTOR (JCI). REFER TO RTU SCHEDULE FOR MORE INFORMATION. INSTALL 48" A.F.F. COORDINATE WITH OWNER TO MEET ADA REQUIREMENTS. PROVIDE CLEAR LOCKING COVER FOR ALL THERMOSTATS AND SENSORS.
5. CONTRACTOR SHALL PATCH, CAP, AND FULLY RESTORE ROOF PENETRATIONS AND ROOFING SYSTEM TO ORIGINAL OR BETTER CONDITION.

ELECTRICAL KEYED NOTES:

1. APPROXIMATE LOCATION OF NEW PANELBOARD SERVING NEW HVAC EQUIPMENT.
2. CONNECT NEW HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. REPROGRAM AND RECONNECT EXISTING DUCT SMOKE DETECTOR.
4. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL REFER TO KEYPLAN. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.
5. PROVIDE NEW DUCT SMOKE DETECTOR.



EDINBURG KEYPLAN

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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

STATE OF TEXAS
CESAR A. GONZALEZ
108611
LICENSED PROFESSIONAL ENGINEER
07.31.2026

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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

Date: 07/31/2026
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: FJR
Job No.: 25V131
Sheet: ME5.02

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DEMOLITION GENERAL NOTES:

1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

MECHANICAL DEMOLITION KEYED NOTES:

1. DEMOLISH DUCTWORK AS SHOWN. DEMOLISH EXISTING DUCTWORK AS NECESSARY TO ACCOMMODATE INSTALLATION OF NEW AHU.
2. PROVIDE NEW COPPER CONDENSATE DRAIN LINES WITH P-TRAPS TO NEW UNIT AND EXTEND THEM TO THE NEW FLOOR DRAIN.
3. EXISTING RTU VFDS AND THEIR COVERED CASING TO BE REMOVED AND DISPOSED OF.
4. REMOVE AND DISPOSE OF EXISTING THERMOSTAT/ THERMOSTAT SENSORS IN EXISTING THERMOSTAT LOCATIONS FOR CW AHU.
5. REMOVE AND DISPOSE OF EXISTING AHUS ALONG WITH ITS ASSOCIATED CONTROLS AND PIPING.
6. REMOVE AND DISPOSE OF EXISTING AHU CONCRETE PAD . SEE NEW PAD LOCATION ON NEW MECHANICAL FLOOR PLAN.
7. EXISTING DUCT HEATER TO BE REMOVED FROM DEMO DUCTWORK AND STORED TO BE REUSED IN NEW DUCTWORK. PROTECT DURING ALL PHASES OF CONSTRUCTION.
8. DEMOLISH EXISTING VFD SERVING E-AHU-1. PREPARE FOR INSTALLATION OF NEW VFD IN SAME LOCATION.
9. DEMOLISH EXISTING CHILL WATER PIPING AS SHOWN ON PLANS.

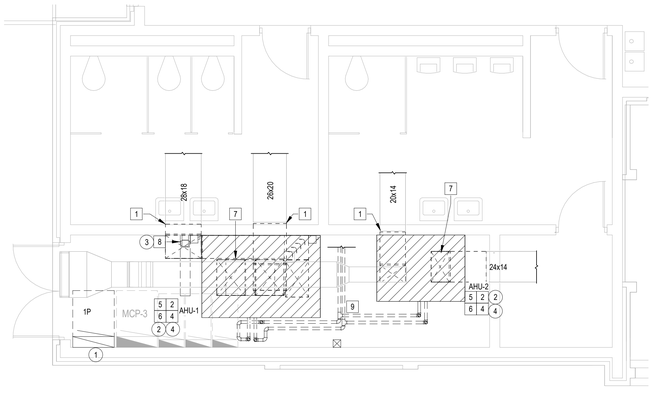
ELECTRICAL DEMOLITION KEYED NOTES

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING EXISTING HVAC EQUIPMENT.
2. DISCONNECT EXISTING HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. DISCONNECT EXISTING VARIABLE FREQUENCY DRIVE. SEE CONNECTION SCHEDULE.
4. DEPROGRAM AND TEMPORARILY DISCONNECT EXISTING DUCT SMOKE DETECTOR.
5. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL REFER TO KEYPLAN. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO; SUPERIOR ALARMS - (956) 793-9771.



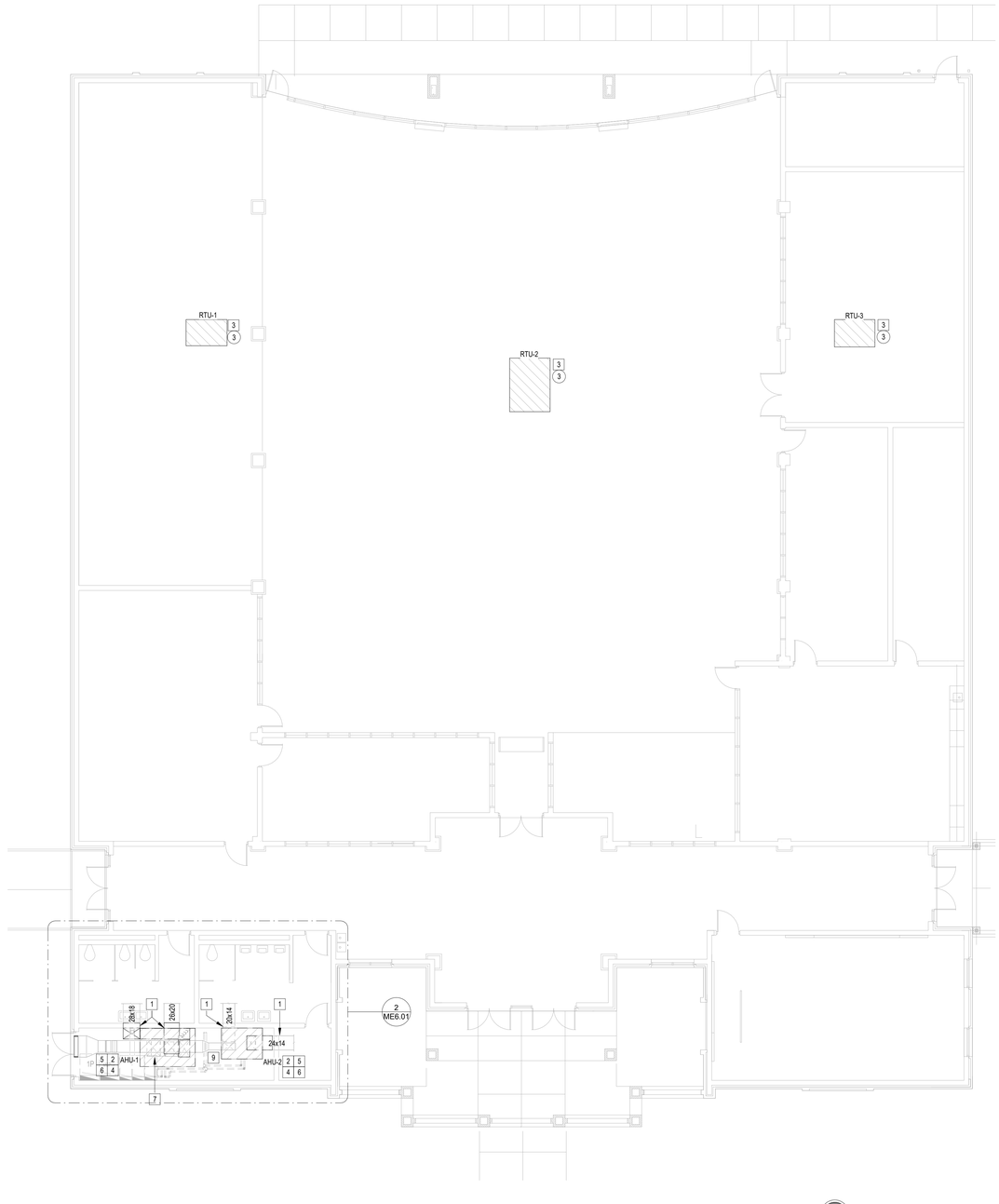
3 EXISTING PANEL "1P" IMAGE

SCALE : NOT TO SCALE



2 Edinburg Demo - Library Mechanical & Electrical Floor Plan - Enlarged

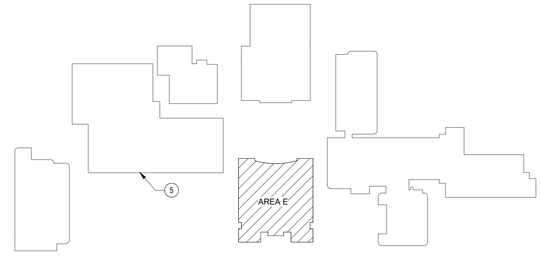
SCALE: 1/4" = 1'-0"



1 STISD Edinburg - Demo Library Mechanical & Electrical Floor Plan

SCALE: 1/8" = 1'-0"

NORTH



EDINBURG KEYPLAN

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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

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Interior Designers

Date: 07/31/2026
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Project Architect: David Monreal, AIA
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(PRE-PURCHASED) CHW AIR HANDLER UNIT SCHEDULE-EDINBURG LIBRARY BUILDING

MARK		NEW	NEW				FAN ELECTRICAL					TOTAL	SENSIBLE	EAT	CHILLED WATER COIL LAT			WEIGHT	MANUFACTURER &	NOTES
	TYPE	SUPPLY CFM	OA CFM	ESP (INCHES)	FAN QTY	MIN. HP PER FAN	V/P/H	FEI / FAN	FAN MCA	KW	FAN MOCP	MBH	MBH	DB/WB	DB/WB	EWT/LWT	GPM	(LBS)	MODEL NUMBER	
AHU-1	SINGLE PATH, HORIZ	4,000.00	600	2.00	1.00	5.00	208/3/60	1.33	19	2.80	-	132.00	100.28	78/65	55.1/54	45/52.7	34.40	1297	CAH009GDGM	ALL
AHU-2	SINGLE PATH, HORIZ	2,000.00	300	2.00	1	2.00	208/30/60	1.31	8.13	1.4	-	71	245	80/67	56.6/55.7	44/54.6	13.3	831	CAH005GDGM	ALL

NOTES:

1. AIR HANDLER HAS BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS. PROVIDE ITEMS BELOW AS PART OF THE INSTALLATION SCOPE OF WORK.
2. SAFETY DISCONNECT PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
3. REFER TO SEQUENCES OF OPERATION FOR CONTROLS SCOPE OF WORK UNDER THE BASE BID AND ALTERNATE.
4. PROVIDE ACTUATORS FOR RA AND OA DAMPERS. COORDINATE WITH CONTROLS CONTRACTOR.
5. EXISTING DUCT MOUNTED ELECTRIC HEATER TO BE REUSED. SET HEATING MODE SUPPLY FAN SPEED AT 2350 CFM VIA THE VFD.
6. CONTRACTOR TO INSTALL AND WIRE OWNER PROVIDED VFD.

(PRE-PURCHASED) STISD - EDINBURG VFD SCHEDULE

MARK	EQUIPMENT SERVED	MOTOR HP	ENCLOSURE	ELECTRICAL V/P/Hz	MANUFACTURER & MODEL NUMBER	NOTES
VFD-AHU-1	LIBRARY AHU-1	5	NEMA 1	208/3/60	S102005T1E013CMD2	ALL
VFD-AHU-2	LIBRARY AHU-2	2	NEMA 1	208/3/60	S102002T1E013CMD2	ALL
VFD-E-RTU-1	LIBRARY RTU-1	1.5	NEMA 3R	208/3/60	S1021H5T1E3R3CMD2	ALL
VFD-E-RTU-2	LIBRARY RTU-2	3	NEMA 3R	208/3/60	S102003T1E3R3CMD2	ALL
VFD-E-RTU-3	LIBRARY RTU-3	5	NEMA 3R	208/3/60	S102005T1E3R3CMD2	ALL

NOTES:

1. VFD HAS BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS.
2. CONTRACTOR RESPONSIBLE FOR TRANSPORTING THE EQUIPMENT FROM OWNER'S WAREHOUSE TO JOBSITE. COORDINATE WITH OWNER.
3. COORDINATE WITH PERRY MECHANICAL SYSTEMS AND INCLUDE ALL ASSOCIATED COSTS IN THE BID.
4. PROVIDE DDC CONTROLS THROUGH AUTOMATED LOGIC. AUTOMATED LOGIC CONTRACTOR SHALL PROVIDE STARTUP AND PROGRAMMING OF ALL CONTROL SEQUENCES.

EQUIPMENT CONNECTION SCHEDULE - EDINBURG LIBRARY BUILDING

DESIGN	NEW MCA	EXISTING MOCP	NEW MOCP	VOLTAGE	EXISTING MEANS OF DISCONNECT	NEW MEANS OF DISCONNECT	EXISTING BRANCH CIRCUIT	NEW BRANCH CIRCUIT 60°C (COPPER)	POWER SOURCE
AHU-1	19	20	1) 45	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	REMOVE EXISTING	3/4" - 3#6 & #10G	1P
AHU-2	8.13	15	1) 20	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	REMOVE EXISTING	1/2" - 3#12 & #12G	1P
E-RTU-1	-	15	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	1P
E-RTU-2	-	35	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	1P
E-RTU-3	-	20	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	1P

GENERAL NOTES:

A. LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL BELOW DUCTWORK OR PLUMBING LINES.

B. PROVIDE NEW BRANCH CONNECTION FROM DISCONNECT TO EQUIPMENT. TYPICAL FOR ALL NEW HVAC EQUIPMENT.

NOTES:

1) REMOVE EXISTING CIRCUIT BREAKER AND PROVIDE NEW TO MATCH NEW MOCP. PROVIDE ALL UL LISTED UNIT FROM EXISTING MANUFACTURER (SQUARE "D"). MATCH EXISTING KAIC.

2) PROVIDED BY DIV.23; INSTALLED AND CONNECTED BY DIV.26.

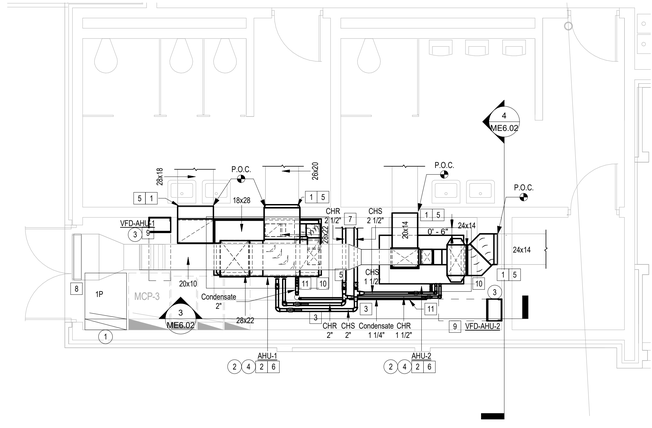
PANELBOARD "1P" (EXISTING): SQUARE "D" I-LINE 600A, 208Y/120V, 3Ø, 4W, 30KAIC



1 STISD Edinburg - Library Mechanical & Electrical Floor Plan

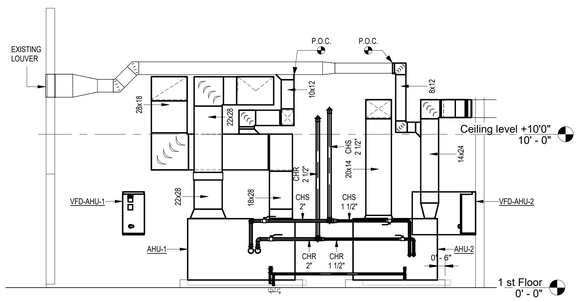
SCALE: 1/8" = 1'-0"

NORTH



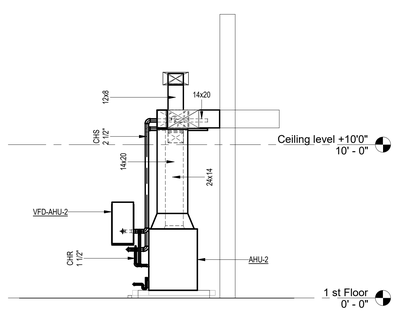
2 Edinburg - Library Mechanical & Electrical Floor Plan - Enlarged

SCALE: 1/4" = 1'-0"



3 Mechanical Room Section View 1

SCALE: 1/4" = 1'-0"



4 Mechanical Room Section View 2

SCALE: 1/4" = 1'-0"

MECHANICAL GENERAL NOTES:

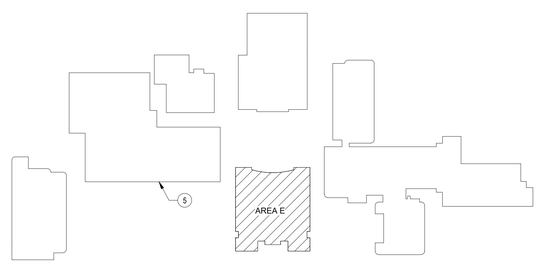
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, AND COMPONENTS TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. RECONNECT TO EXISTING DUCTWORK, UNLESS NOTED OTHERWISE.
2. INSTALL OWNER'S PRE-PURCHASED AIR HANDLER UNIT (AHU) IN MECHANICAL ROOM AND ITS ASSOCIATED ACCESSORIES. PROVIDE WATER LEVEL DETECTION DEVICE THAT WILL SHUT-OFF THE AHU PRIOR TO OVERFLOW. REFER TO DETAILS SHEET. TO EXTENT POSSIBLE, REUSE AND RECONNECT TO EXISTING DUCTWORK.
3. PROVIDE NEW CHILL WATER PIPING IN THE APPROXIMATE LOCATION AS EXISTING, INSULATED AND JACKETED AS SPECIFIED. SLEEVE ALL PENETRATION AND SEAL AIR TIGHT AROUND PIPE PENETRATIONS WITH FIRE-PROOF CAULKING. PROVIDE ESCUTCHEON PLATES AND FLASHING AROUND PENETRATIONS, BOTH INSIDE AND OUTSIDE TO PROVIDE A FINISHED LOOK. PROVIDE CHILL WATER LINE SUPPORTS PER DETAILS AND SPECIFICATIONS.
4. CONTROLS CONTRACTOR SHALL INSTALL PURCHASED VFDS, COORDINATE WITH ALC CONTROLS FOR COMPLETE SYSTEM INTEGRATION, PERFORM START-UP AND COMMISSIONING, INCLUDING COMMUNICATIONS SETUP, POINT VERIFICATION, PROGRAMMING COORDINATION, AND FUNCTIONAL TESTING TO ENSURE PROPER OPERATION.
5. PROVIDE NEW DUCTWORK CONNECTIONS BETWEEN THE NEW AHU AND THE EXISTING DUCTWORK TO CREATE A FULLY OPERATIONAL SYSTEM AS SCHEDULED.
6. PROVIDE NEW THERMOSTAT AND THERMOSTAT SENSOR. MECHANICAL CONTRACTOR TO LOCATE EXISTING THERMOSTAT AND SENSOR TO REPLACE FOR NEW. ALL DDC TO GO THROUGH AUTOMATED LOGIC CONTROLS
7. RECONNECT EXISTING CHILL WATER PIPING TO EXISTING CONNECTIONS. PROVIDE NECESSARY AND ACCESSORIES AS NEEDED.
8. EXISTING OA LOUVER TO REMAIN. RECONNECT ITS EXISTING OUTSIDE AIR DUCTWORK TO NEW AHU RETURN DUCTWORK. FIELD COORDINATE EXACT LOCATION.
9. PROVIDE REPURCHASED VFD PER SCHEDULE WITH NEMA-1 ENCLOSURE FOR MOUNTING INDOORS. (TYPICAL)
10. PROVIDE NEW PRE-PURCHASED CHILL WATER AHU ON TO EXISTING CONCRETE PAD. COORDINATE WITH STRUCTURE ON EXISTING CURB MODIFICATION AS NEEDED. PLUMBING CONTRACTOR TO RELOCATE EXISTING FLOOR DRAIN TO EXTEND OUTSIDE OF EXISTING CONCRETE PAD.
11. ROUTE NEW PRE PURCHASED CONDENSATE PIPING TO NEW RELOCATED FLOOR DRAIN. COORDINATE WITH PLUMBING DRAWING FOR NEW FLOOR DRAIN LOCATION.

ELECTRICAL KEYED NOTES

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING NEW HVAC EQUIPMENT.
2. CONNECT NEW HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. CONNECT NEW VARIABLE FREQUENCY DRIVE. SEE EQUIPMENT CONNECTION SCHEDULE.
4. REPROGRAM AND RECONNECT EXISTING DUCT SMOKE DETECTOR.
5. APPROXIMATE LOCATION OF EXISTING NOTIFIER FIRE ALARM CONTROL PANEL. REFER TO KEYPLAN. PRIME CONTRACTORS SHALL CONTACT PRE-APPROVED SUBCONTRACTORS TO WORK ON SUCH SYSTEMS AS BUT NOT LIMITED TO: SUPERIOR ALARMS - (956) 793-9771.



EDINBURG KEYPLAN

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STISD HVAC Project 26-27

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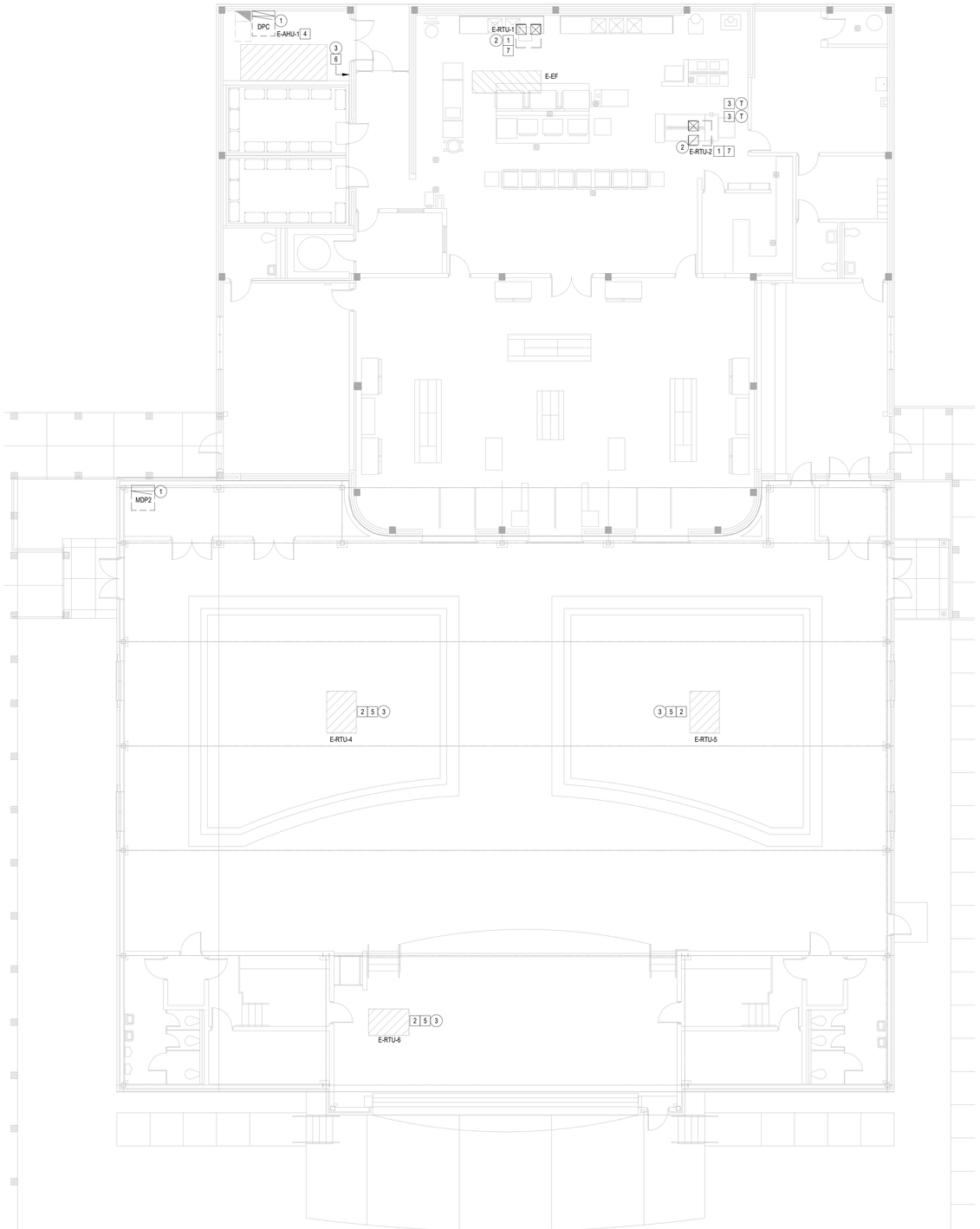
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Interior Designers

Date:	07/31/2026
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Project Architect:	David Monreal, AIA
Drawn By:	FJR
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1 STISD Edinburg - Demo Kitchen Mechanical Floor Plan

SCALE: 1/8" = 1'-0"

NORTH

DEMOLITION GENERAL NOTES:

1. DRAWINGS SHOWING ALL EQUIPMENT LOCATIONS, DUCT AND PIPE SIZES, ELEVATIONS, AND ELECTRICAL INFORMATION HAVE BEEN RECREATED USING DRAWINGS AND SITE SURVEYS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE CONDITIONS IN ORDER TO MAKE ANY NECESSARY ADJUSTMENTS, PRIOR RO ORDERING MATERIAL OR COMMENCING INSTALLATION. CHANGE ORDERS WILL NOT BE APPROVED FOR DIMENSIONAL VERIFICATIONS REQUIRING MINOR ADJUSTMENTS NEEDED TO COMPLETE INSTALLATION.
2. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIAL. COORDINATE WITH, AND DISPOSE OF EQUIPMENT AND MATERIAL THAT OWNER DOES NOT RETAIN.

MECHANICAL DEMOLITION KEYED NOTES:

1. REMOVE AND DISPOSE OF EXISTING RTU, INCLUDING ALL ASSOCIATED CURB ATTACHMENTS, ASSOCIATED CONTROLS, CONTROL WIRING, AND PIPING CONNECTIONS.
2. REMOVE AND DISPOSE OF EXISTING RTU VFDS, INCLUDING ASSOCIATED ENCLOSURES, COVERS, AND ACCESSORIES.
3. REMOVE AND DISPOSE OF EXISTING THERMOSTATS ASSOCIATED WITH EXISTING RTU SCHEDULED FOR REMOVAL. CONTRACTOR SHALL VERIFY EXISTING DEVICE LOCATIONS IN FIELD AND INSTALL NEW THERMOSTATS IN EXISTING LOCATIONS.
4. EXISTING AHU TO REMAIN AND REUSED. PROJECT DURING ALL PHASES OF CONSTRUCTION.
5. EXISTING RTU TO REMAIN PROTECT DURING ALL PHASES OF CONSTRUCTIONS.
6. REMOVE AND DISPOSE OF EXISTING AHU VFDS, INCLUDING ASSOCIATED ENCLOSURES, COVERS, AND ACCESSORIES.
7. TEMPORARILY REMOVE EXISTING CEILING TILES AND GRID THAT ARE LOCATED UNDERNEATH THE FOOTPRINT OF THE EXISTING RTU SCHEDULED TO BE DEMOLISHED AND AS NECESSARY TO PROVIDE WORKING AREA FREE FROM OBSTACLES FOR THE STRUCTURAL REINFORCEMENT WORK REQUIRED TO ACCOMMODATE THE NEW RTU AND ASSOCIATED CURBS. COORDINATE WITH GENERAL, ROOFING, AND STRUCTURAL CONTRACTORS. REINSTALL CEILING TILES AND GRID AFTER WORK ABOVE CEILING HAS BEEN COMPLETED.

ELECTRICAL DEMOLITION KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING EXISTING HVAC EQUIPMENT.
2. DISCONNECT EXISTING HVAC EQUIPMENT FOR REPLACEMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. DISCONNECT EXISTING VARIABLE FREQUENCY DRIVE FOR REPLACEMENT.



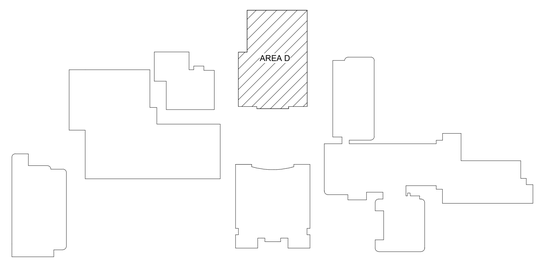
2 EXISTING PANELBOARD "DPC" IMAGE

SCALE : NOT TO SCALE



3 EXISTING PANELBOARD "MDP-2" IMAGE

SCALE : NOT TO SCALE



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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

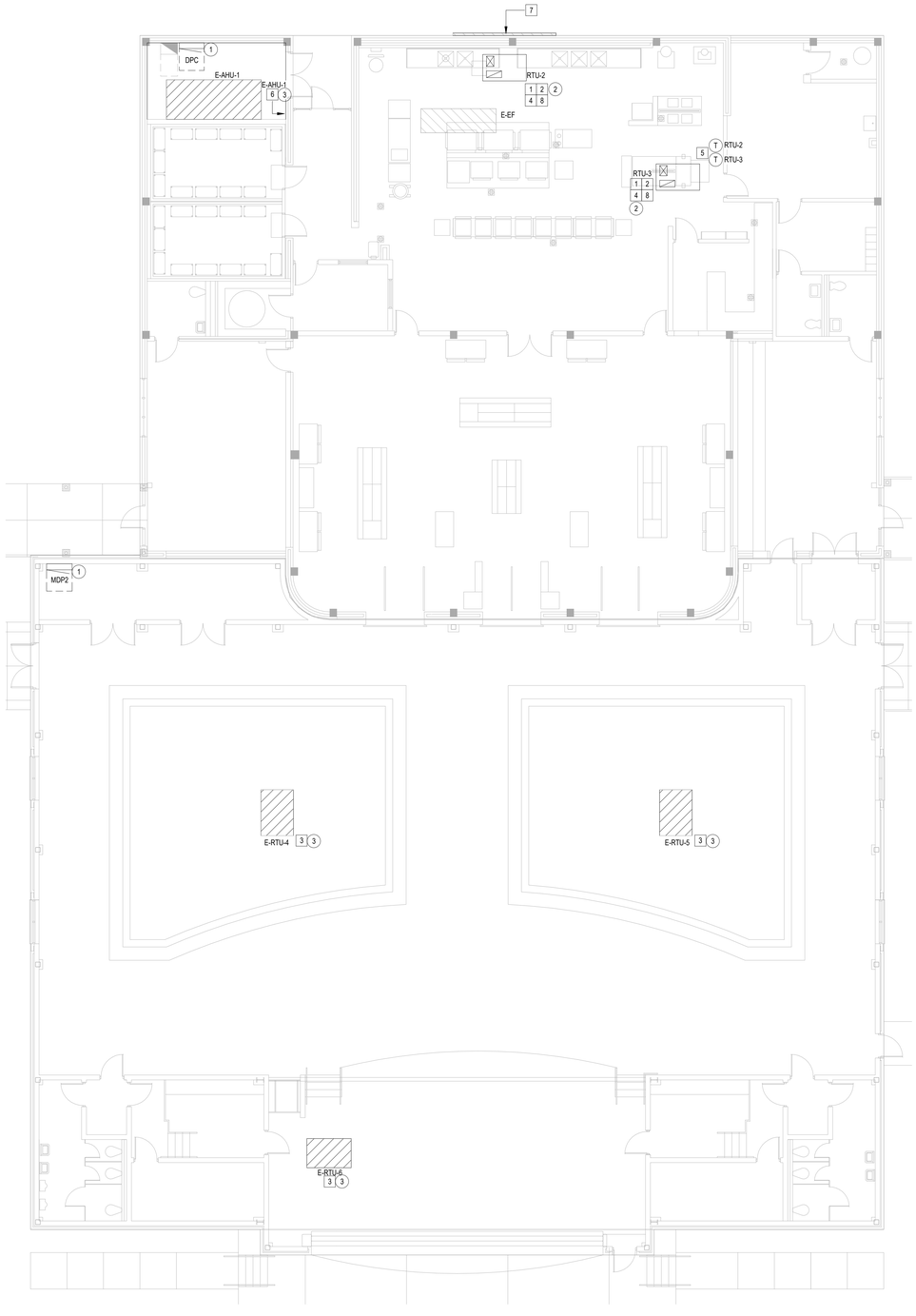


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Architects-Planners
Interior Designers

Date:	07/31/2026
Scale:	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	FJR
Job No.	25V131
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1 STISD Edinburg - Kitchen Mechanical Floor Plan

SCALE: 1/8" = 1'-0"

NORTH

(PRE-PURCHASED) EDINBURG STISD DX ROOF TOP UNIT SCHEDULE

MARK	NOMINAL TONS	SERVERS	SUPPLY CFM	OA CFM	ESP (INCHES)	MIN HP	MCA A	MOCP A	ELECTRICAL V-PH-HZ	AIR ON COND.	COOLING				HEATING		CONVENIENCE OUTLETS	MIN IEER/EER	WEIGHT (LBS.)	NOTES	MANUFACTURER	MODEL NUMBER
											TOTAL	SENSIBLE	EAT	LAT	KW	STG.						
											BTUH	BTUH	DB/WB	DB/WB								
RTU-2	3	KITCHEN	1140	140	1	0.75	29.7	40	208-3-60	100	33,746	25,691	78/65	57.50/55.20	5	1	FACTORY INSTALLED & UNIT POWERED	14.0/12.0	484	ALL	DAIKIN	DSC036
RTU-3	5	KITCHEN	1890	200	1	1.0	38.7	60	208-3-60	100	55,668	42,662	78/65	57.40/55.30	5	1	FACTORY INSTALLED & UNIT POWERED	13.7/11.8	512	ALL	DAIKIN	DSC060

NOTES:

1. ACCU'S HAVE BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS.
2. INSTALL OWNER PROVIDED CONDENSOR HAIL GUARD.
3. PROVIDE MULTI STAGE AIR VOLUME TO MATCH COMPRESSOR UNLOADING. PROVIDE 2 STAGE COMPRESSOR OR A 2 CIRCUIT SYSTEM.
4. PROVIDE MOTORIZED OA DAMPER, CONTROLLER, UL LEAKAGE DAMPERS, DEMAND CONTROL VENTILATION, AND NO BAROMETRIC RELIEF DAMPERS ANYWHERE.
5. INSTALL PRE PURCHASED THERMOSTAT.
6. PROVIDE IBC 2021 COMPLIANT 24" NEW ROOF CURB AND ATTACHMENTS FROM UNIT TO CURB AND CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
   1) ATTACHMENT OF EQUIPMENT TO CURB.
   2) CURB TO STRUCTURE.
   3) CURB AND ATTACHMENT HARDWARE STRENGTH.
   REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS.
   EQUIPMENT OR CURB MANUFACTURER IS ALSO RESPONSIBLE FOR PROVIDING ENGINEERED INSTALLATION DRAWINGS FOR ITEMS 1 AND 2 LISTED ABOVE.
   BOTH, THE ENGINEERED ANALYSIS AND THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING AND PROJECT SITE AND STAMPED AND SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.

(PRE-PURCHASED) STISD - EDINBURG VFD SCHEDULE

MARK	EQUIPMENT SERVED	MOTOR HP	ENCLOSURE	ELECTRICAL V/P/Hz	MANUFACTURER & MODEL NUMBER	NOTES
VFD-E-AHU-1	CAFÉ AHU-1	7.5	NEMA 1	208/3/60	S1027H5T1E013CMD2	ALL
VFD-E-RTU-4	CAFE RTU-4	5	NEMA 3R	208/3/60	S102005T1E3R3CMD2	ALL
VFD-E-RTU-5	CAFE RTU-5	5	NEMA 3R	208/3/60	S102005T1E3R3CMD2	ALL
VFD-E-RTU-6	CAFE RTU-6	1.5	NEMA 3R	208/3/60	S1021H5T1E3R3CMD2	ALL

NOTES:

1. VFD HAS BEEN PRE-PURCHASED BY OWNER. REFER TO EQUIPMENT SUBMITTALS INCLUDED IN THE SPECIFICATIONS.
2. CONTRACTOR RESPONSIBLE FOR TRANSPORTING THE EQUIPMENT FROM OWNER'S WAREHOUSE TO JOBSITE. COORDINATE WITH OWNER.
3. COORDINATE WITH PERRY MECHANICAL SYSTEMS AND INCLUDE ALL ASSOCIATED COSTS IN THE BID.
4. PROVIDE DDC CONTROLS THROUGH AUTOMATED LOGIC. AUTOMATED LOGIC CONTRACTOR SHALL PROVIDE STARTUP AND PROGRAMMING OF ALL CONTROL SEQUENCES.

EQUIPMENT CONNECTION SCHEDULE

DESIGN	NEW MCA	EXISTING MOCP	NEW MOCP	VOLTAGE	EXISTING MEANS OF DISCONNECT	NEW MEANS OF DISCONNECT	EXISTING BRANCH CIRCUIT	NEW BRANCH CIRCUIT 60°C (COPPER)	POWER SOURCE
RTU-2	29.7	60	1) 40	208V/3-PHASE	REMOVE EXISTING	60A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	3/4" - 3#8 & #10G	DPC
RTU-3	38.7	60	1) 60	208V/3-PHASE	REMOVE EXISTING	60A, 3PNF, 240V, NEMA 3R	REMOVE EXISTING	1" - 3#4 & #10G	DPC
E-RTU-4	-	50	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	MDP2
E-RTU-5	-	50	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	MDP2
E-RTU-6	-	20	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	MDP2
E-AHU-1	-	-	-	208V/3-PHASE	REMOVE EXISTING	2) VARIABLE FREQUENCY DRIVE	RETAIN EXISTING	-	DPC

GENERAL NOTES:

A. LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL BELOW DUCTWORK OR PLUMBING LINES.

B. PROVIDE NEW BRANCH CONNECTION FROM DISCONNECT TO EQUIPMENT. TYPICAL FOR ALL NEW HVAC EQUIPMENT.

NOTES:

1) REMOVE EXISTING CIRCUIT BREAKER AND PROVIDE NEW TO MATCH NEW MOCP. PROVIDE ALL UL LISTED UNIT FROM EXISTING MANUFACTURER (SQUARE "D"). MATCH EXISTING KAIC.

2) PROVIDED BY DIV.23; INSTALLED AND CONNECTED BY DIV.26.

PANELBOARD "DPC" (EXISTING): SQUARE "D" I-LINE, 1200A, 208Y/120V, 3Ø, 4W.
PANELBOARD "MDP2" (EXISTING): SQUARE "D" I-LINE, 800A, 208Y/120V, 3Ø, 4W.

MECHANICAL GENERAL NOTES:

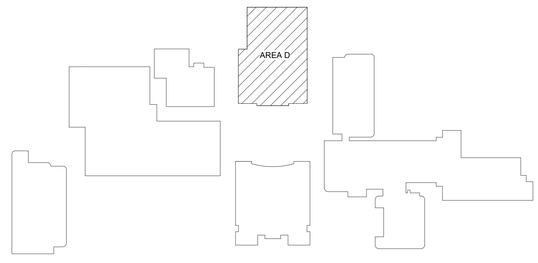
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, AND COMPONENTS TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. INSTALL OWNER'S PRE-PURCHASED ROOFTOP UNIT (RTU) ON ROOF AND ITS ASSOCIATED ACCESSORIES. RECONNECT TO EXISTING DUCTWORK, UNLESS NOTED OTHERWISE.
2. PROVIDE NEW CONDENSATE PIPING IN THE SAME LOCATION AS EXISTING. INSULATED AND JACKETED AS SPECIFIED. SLEEVE ALL PENETRATION AND SEAL AIR TIGHT AROUND PIPE PENETRATIONS WITH FIRE-PROOF CAULKING. PROVIDE ESCUTCHEON PLATES AND FLASHING AROUND PENETRATIONS, BOTH INSIDE AND OUTSIDE TO PROVIDE A FINISHED LOOK. PROVIDE CONDENSATE LINE SUPPORTS PER DETAILS AND SPECIFICATIONS.
3. CONTROLS CONTRACTOR SHALL INSTALL PURCHASED VFDS. COORDINATE WITH ALC CONTROLS FOR COMPLETE SYSTEM INTEGRATION, PERFORM START-UP AND COMMISSIONING, INCLUDING COMMUNICATIONS SETUP, POINT VERIFICATION, PROGRAMMING COORDINATION, AND FUNCTIONAL TESTING TO ENSURE PROPER OPERATION.
4. PROVIDE NEW DUCTWORK CONNECTIONS BETWEEN THE NEW RTUS AND THE EXISTING DUCTWORK TO CREATE A FULLY OPERATIONAL SYSTEM AS SCHEDULED.
5. PROVIDE NEW THERMOSTAT AND CO2 SENSOR MOUNTED 48" A.F.F. MECHANICAL CONTRACTOR TO LOCATE EXISTING THERMOSTAT TO REPLACE FOR NEW.
6. CONTROLS CONTRACTOR SHALL INSTALL PRE- PURCHASED NEMA-1 VFDS. COORDINATE WITH ALC CONTROLS FOR COMPLETE SYSTEM INTEGRATION, PERFORM START-UP AND COMMISSIONING, INCLUDING COMMUNICATIONS SETUP, POINT VERIFICATION, PROGRAMMING COORDINATION, AND FUNCTIONAL TESTING TO ENSURE PROPER OPERATION.
7. PROVIDE PROTECTIVE GUARDRAIL BY STRUCTURAL.
8. PROVIDE PRE-PURCHASED RTU ON NEW 24" ROOF CURB AS SCHEDULED. ORIENT RTUS TO OPTIMIZE DUCTWORK. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER TIGHT.

ELECTRICAL KEYED NOTES

1. APPROXIMATE LOCATION OF EXISTING PANELBOARD SERVING NEW HVAC EQUIPMENT.
2. CONNECT NEW HVAC EQUIPMENT. SEE EQUIPMENT CONNECTION SCHEDULE.
3. CONNECT NEW VARIABLE FREQUENCY DRIVE. SEE EQUIPMENT CONNECTION SCHEDULE.



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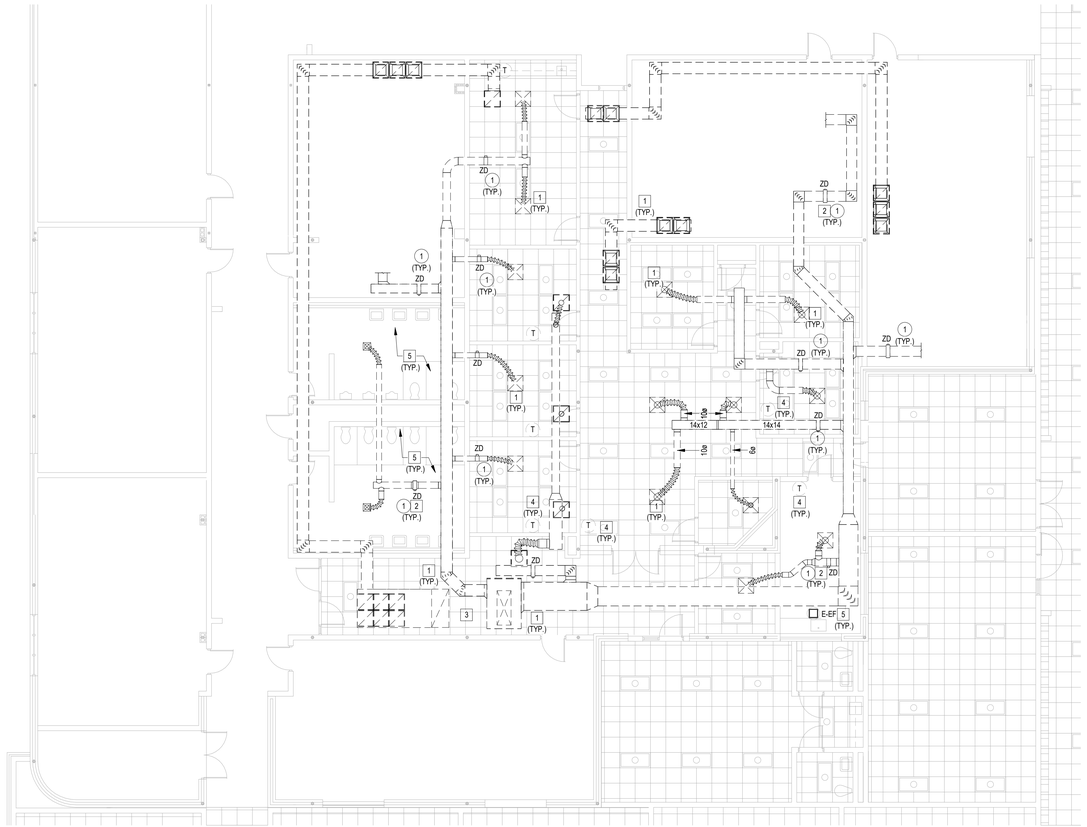
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01 Demolition 1 st Floor Mechanical Plan World Scholar - Alternate

SCALE: 1/8" = 1'-0"

NORTH

DEMOLITION GENERAL NOTES:

1. REMOVED MATERIALS SHALL BELONG TO OWNER. DELIVER THEM TO OWNERS DESIGNATED LOCATION. IF OWNER DOES NOT WANT THE REMOVED MATERIALS THEN REMOVE THEM FROM SITE & PROPERLY DISPOSE OF THEM.
2. IF REMOVAL OF EXISTING ELECTRICAL SYSTEMS RENDERS EXISTING ELECTRICAL SYSTEMS DOWNSTREAM TO REMAIN INOPERABLE, PROVIDE J-BOXES, CONDUIT WIRING AND SPLICES ABOVE ACCESSIBLE CEILINGS IN ORDER TO CONTINUE OPERATION.
3. PRIOR TO DEMOLITION, IN CEILINGS SCHEDULED TO BE REMOVED AND (OR) REPLACED FOR NEW WORK, PREPARE REFLECTED CEILING PLAN SKETCH SHOWING LOCATIONS OF ALL CEILING COMPONENTS AND DEVICES TO BE RE-USED INCLUDING BUT NOT LIMITED TO:
   - LIGHT FIXTURES
   - SPEAKERS
   - WIRELESS ACCESS POINTS
   - FIRE ALARM DEVICES
   - ETC.

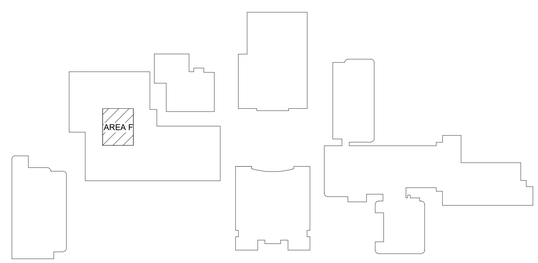
   IF ANY OF THE ABOVE ITEMS ARE IN NON-WORKING CONDITION, SUBMIT A WRITTEN REPORT TO OWNER/ARCHITECT. TEMPORARY SUPPORT AND OR REMOVAL OF THESE SYSTEMS SHALL BE PROVIDED FOR NEW WORK.
4. PROVIDE BLANK COVERPLATE FOR UNUSED BACKBOXES.

MECHANICAL DEMOLITION KEYED NOTES:

1. DEMOLISH EXISTING DIFFUSERS/GRILLES, DUCTWORK, DUCTWORK ACCESSORIES AND ASSOCIATED SUPPORTS AS SHOWN. REFER TO NEW PLAN FOR NEW DUCTWORK AND DIFFUSER LAYOUT.
2. DEMOLISH EXISTING ZONE DAMPERS AND RELATED CONTROL DEVICES SERVING ZONE DAMPERS SCHEDULED FOR DEMOLITION. COORDINATE WITH CONTROLS CONTRACTOR.
3. EXISTING ROOFTOP UNIT AND ITS PENETRATIONS TO REMAIN. PROTECT DURING ALL PHASES OF CONSTRUCTION. CLEAN RTU SUPPLY AND RETURN AIR CONNECTIONS AFTER DEMOLITION AND PRIOR TO INSTALLATION OF NEW DUCTWORK.
4. DEMOLISH AND REMOVE EXISTING THERMOSTATS AND ASSOCIATED CONTROLS. COORDINATE WITH NEW MECHANICAL FLOOR PLANS FOR NEW LOCATION.
5. EXISTING EXHAUST FAN TO REMAIN. LOCATE AND PROTECT DURING ALL PHASES OF CONSTRUCTION.

ELECTRICAL DEMOLITION KEYED NOTES:

1. DISCONNECT EXISTING ZONE DAMPER CONTRACTOR TO FIELD VERIFY EXISTING POWER SOURCE - TYPICAL.



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AIR DEVICE & DIFFUSER SCHEDULE

SUPPLY AIR DIFFUSER (SD-1)					
TITUS OMNI-AA NC < 20			DESCRIPTION: ALUMINUM SQUARE CEILING DIFFUSER, FIELD VERIFY CEILIING TYPE, COLOR WHITE WITH ROUND NECK AND FULL FACE		
CLG. MODULE SIZE INCHES	FACE SIZE INCHES	ROUND NECK SIZE	FLEX DUCT SIZE	DIFFUSER DIFFUSION PATTERN & CFM	NOTES
24 X 24	24 X 24	TO MATCH NC CRITERIA	SEE PLAN	SD1-CFM	1-4,6

RETURN AND TRANSFER AIR GRILLE (RG-1 & TG-1)				
TITUS 50F NC < 20			DESCRIPTION: ALUMINUM GRID EGGCRATE RETURN GRILLE WITH BORDER TYPE 3 (LAY-IN).	
CFM RANGE	CLG. MODULE SIZE INCHES	NOMINAL DUCT SIZE INCHES (INLET)	DIFFUSER DIFFUSION PATTERN & CFM	NOTES
0 - 2500	24 X 24	18 X 18	EG1-CFM (EXHAUST AIR GRILLES ONLY)	1,2,4,5,6
0 - 2500	24 X 24	18 X 18	TG1-CFM (TRANSFER AIR GRILLES ONLY)	1,4,6

NOTES:

1. PROVIDE MANUFACTURER'S STANDARD BAKED WHITE ENAMEL FINISH.
2. PROVIDE FULL SIZE BACK PAN WITH DUCT ADAPTER.
3. INSULATE BACK PAN ON ALL SUPPLY AIR DIFFUSERS AND GRILLES.
4. PROVIDE MOUNTING FRAME TYPE COMPATIBLE WITH SCHEDULED CEILING OR WALL (SURFACE OR LAY-IN).
5. PROVIDE BALANCING DAMPER ON ALL EXHAUST GRILLES.
6. AIR DEVICES SHALL MATCH ARCHITECTURAL FINISH. COORDINATE COLOR WITH ARCHITECT.

ZONE DAMPER SCHEDULE

PROJECT: WORLD SCHOLAR BUILDING STISD EDINBURG

MARK	CAPACITY RANGE CFM	DAMPER DIAMETER SIZE (IN.)	DAMPER RECTANGULAR SIZE (IN.)	MINIMUM FLOW (%)	MANUFACTURER MODEL	PRESSURE DROP	NOTES
ZD-1	0 - 500	-	10 x 10	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.013 IN.WG	ALL
ZD-2	0 - 250	8	-	30%	GREENHECK-VCDR-63 ALC - ACTUATOR	.004 IN.WG	ALL
ZD-3	0 - 250	8	-	30%	GREENHECK-VCDR-63 ALC - ACTUATOR	.004 IN.WG	ALL
ZD-4	0 - 250	8	-	30%	GREENHECK-VCDR-63 ALC - ACTUATOR	.004 IN.WG	ALL
ZD-5	0 - 1100	-	14 x 12	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.017 IN.WG	ALL
ZD-6	0 - 400	-	8 x 10	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.018 IN.WG	ALL
ZD-7	0 - 610	-	12 x 10	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.012 IN.WG	ALL
ZD-8	0 - 875	-	14 x 12	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.011 IN.WG	ALL
ZD-9	0 - 975	-	16 x 14	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.006 IN.WG	ALL
ZD-10	0 - 1100	-	14 x 14	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.012 IN.WG	ALL
ZD-11	0 - 1500	-	16 X 14	30%	GREENHECK-VCD-33 ALC - ACTUATOR	.015 IN.WG	ALL

NOTES:

1. PROVIDE UNIT WITH 24V TRANSFORMER AND FUSIBLE INTEGRAL DISCONNECT.
2. COORDINATE INLET AND OUTLET DIMENSIONS WITH PLANS.
3. COORDINATE WITH DRAWINGS FOR RIGHT OR LEFT-HAND CASING CONFIGURATION PRIOR TO ORDERING.

MECHANICAL GENERAL NOTES:

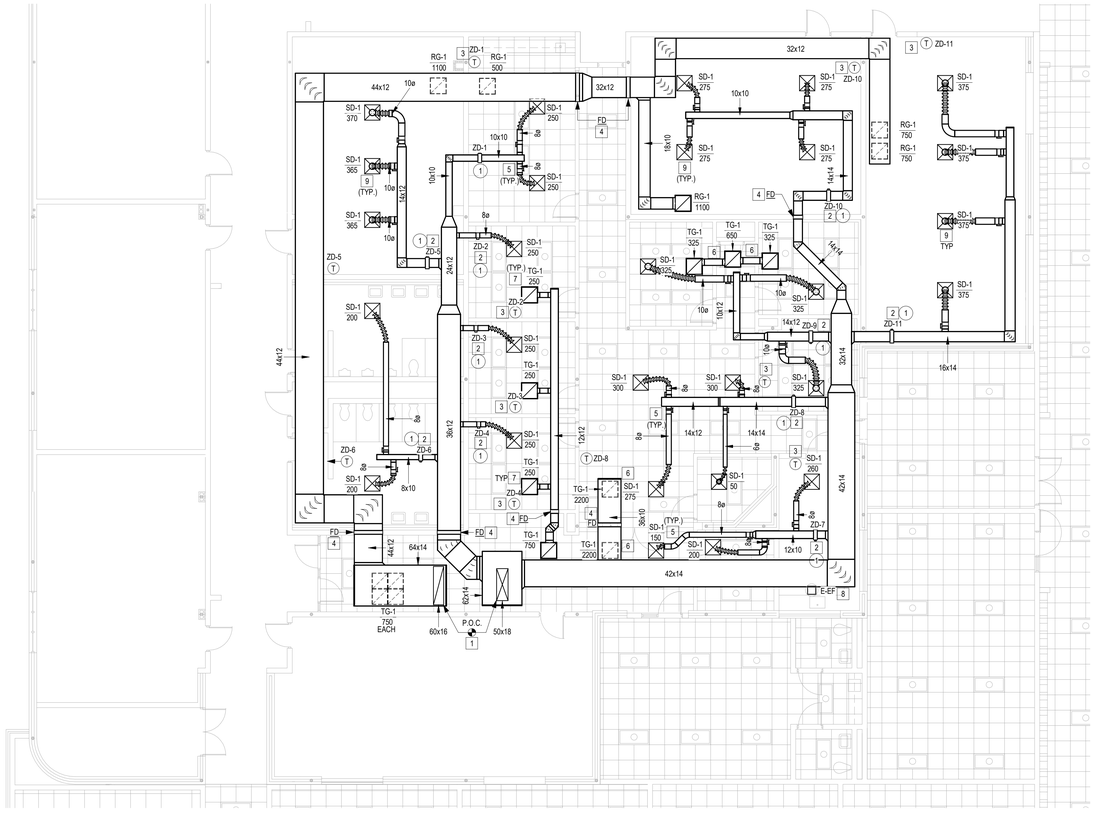
1. DUCTWORK IS TO BE RETAINED. ORIENT EQUIPMENT TO MINIMIZE DUCTWORK MODIFICATIONS. SEAL ALL OPENINGS AND ENSURE THAT INSTALLATION IS WEATHER-TIGHT. PROVIDE REQUIRED MODIFICATIONS FOR A COMPLETE AND SEAMLESS INSTALLATION.
2. PERFORM DUCTWORK TIE-IN FROM NEW UNITS TO EXISTING DUCTS VIA FLEX CONNECTORS AND TRANSITION DUCTWORK. FIELD-VERIFY EXISTING SPACE AVAILABILITY PRIOR TO BIDDING AND PRIOR TO SUBMITTING DUCTWORK SHOP DRAWINGS.
3. UNLESS OTHERWISE NOTED PROVIDE CONDENSATE DRAIN LINES WITH P-TRAPS, AND EXTEND TO NEAREST CONDENSATE DRAIN RECEPTOR. SUPPORT PIPING ON PIPING SUPPORTS BY MIRO INDUSTRIES, MODEL 1.5, OR EQUAL.
4. AFTER ABOVE CEILING WORK IS COMPLETE, REINSTALL CEILING SYSTEMS, AND COMPONENTS TO ORIGINAL CONDITION.

MECHANICAL KEYED NOTES:

1. EXISTING ROOFTOP UNIT TO REMAIN, CONNECT NEW DUCTWORK TO EXISTING UNIT CONNECTION. FILED VERIFY EXACT UNIT LOCATION, ROOF PENETRATIONS, AND NEW DUCT ROUTING TO AVOID EXISTING STRUCTURAL BEAMS.
2. PROVIDE NEW GREENHECK ZONE DAMPER WITH ALC ACTUATOR. PROVIDE ALL REQUIRED CONTROLS AND ACCESSORIES FOR A COMPLETE INSTALLATION AS INDICATED ON PLANS.
3. PROVIDE NEW THERMOSTAT CONTROLS FOR NEW ZONE DAMPERS LOCATED IN DUCTWORK.
4. PROVIDE 1-1/2 HOUR RATING, DYNAMIC FIRE DAMPER EQUAL TO RUSKIN DIBD2 AND DUCT ACCESS DOOR EQUAL TO RUSKIN ADH-22 FOR RECTANGULAR DUCT, ACUDOR RD FOR ROUND DUCT. PROVIDE FIRE DAMPER AT WALL PENETRATIONS AS SHOWN. : ACCESS PANEL SHALL BE IN CEILING SPACE. (TYPICAL)
5. PROVIDE ROUND SPIRAL LOCK-SEAM DUCT. LONGITUDINAL SEAM TYPE IS NOT ACCEPTABLE. (TYPICAL)
6. PROVIDE ACOUSTICAL LINING FOR TRANSFER DUCT. SEE SPECIFICATIONS. (TYPICAL)
7. PROVIDE FABRICATED RETURN AIR PLENUM BOX ABOVE RETURN GRILLE. INSTALL ACOUSTICAL LINING IN PLENUM BOX. CONNECT WITH FLEX DUCT TO MAIN RETURN TRUNK DUCT WHERE SHOWN ON DRAWING AND INSTALL BALANCING DAMPER WHERE INDICATED. FOR AREAS WHERE FLEX DUCT IS NOT SHOWN, PROVIDE ACOUSTICAL LINING FOR CONNECTION TO MAIN RETURN TRUNK DUCT. SEE DETAIL SHEET. (TYPICAL)
8. EXISTING EXHAUST FAN TO REMAIN. LOCATE AND PROTECT DURING ALL PHASES OF CONSTRUCTION.
9. FIELD COORDINATE EXACT DIFFUSER/GRILLE LOCATION WITH EXISTING CEILING GRIDS.

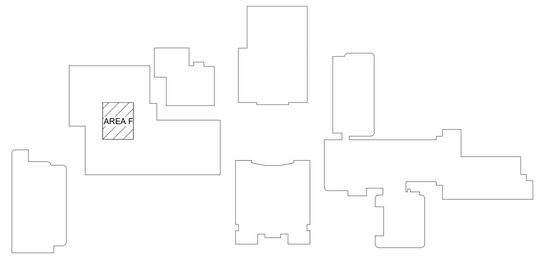
ELECTRICAL RENOVATION KEYED NOTES:

1. CONNECT NEW ZONE DAMPER, RETAIN AND REUSE EXISTING BRANCH CIRCUIT. CONTRACTOR TO FIELD VERIFY EXISTING POWER SOURCE -TYPICAL.



01 1 st Floor Mechanical Plan World Scholar - Alternate
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NORTH



EDINBURG KEYPLAN

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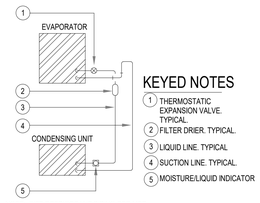
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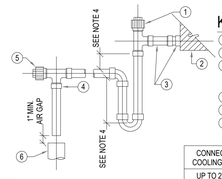
KEYED NOTES

1. THERMOSTATIC EXPANSION VALVE. TYPICAL.
2. FILTER DRIER. TYPICAL.
3. LIQUID LINE. TYPICAL
4. SUCTION LINE. TYPICAL.
5. MOISTURE/LIQUID INDICATOR

NOTE: SIZE REFRIGERANT PIPING PER MFR. RECOMMENDATION.

01 REFRIGERANT PIPING DIAGRAM DETAIL

SCALE: NOT TO SCALE



KEYED NOTES

1. CLEAN OUT.
2. DRAIN PAN.
3. DRAIN LINE SHALL BE AT LEAST OF THE SAME SIZE AS THE DRAIN PAN SIZE AS THE DRAIN PAN
4. PITCH.
5. CLEAN OUT.
6. OPEN DRAIN.

NOTES:

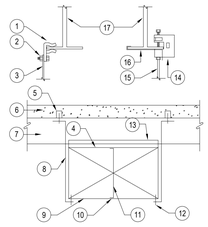
1. MANUALLY PRIME TRAP BEFORE START UP.
2. SUPPORT DRAIN LINES TO PREVENT SAG.
3. ALLOW SUFFICIENT SPACE BELOW PAN FOR TRAP AND PITCH TO DRAIN.
4. COORDINATE WITH MANUFACTURER OF AHU.

CONNECTED COOLING LOAD	MIN. * PIPE SIZE
UP TO 2 TON	3/4"
2-5	1"
5-30	1-1/4"
30-50	1-1/2"
50-160	2"
160-300	3"
300-430	4"

* NOT SMALLER THAN OUTLET SIZE.

02 CONDENSATE DRAIN TRAP PIPE DETAIL

SCALE: NOT TO SCALE



KEYED NOTES

1. FRICTION CLAMP.
2. NUT & BOLT.
3. HANGER STRAP.
4. ARRANGE SEAM JOINTS TO MISS BEAMS.
5. INSERT-DO NOT INSERT INTO BOTTOM OF BEAMS OR JOISTS.
6. CEILING SLAB.
7. CONSTRUCTION BEAM.
8. 1" X 18 GA. STRAP HANGER (ONE HANGER ON DUCTS 31" AND UP).
9. DUCT WITH FLAT SEAM CONSTRUCTION (STANDARD "S" SLIP SNUG TO BEAM).
10. 3/16" SD 64BS POP RIVETS (TWO EACH AT TOP & BOTTOM OF VERTICAL STIFFENER).
11. 1-1/2" X 16 GA. STEEL BAR SUPPORT LOCATED CLOSE TO STIFFENER: DUCT WIDTH TO 24" - NOT REQUIRED DUCT WIDTH 25" TO 47" - ONE (1) REQUIRED.
12. #6 X 3/8" SIM SCREW (TYP).
13. ANGLE STIFFENER FOR DUCT WIDTH 25" TO 40": 1" STANDING "S" OR 1" X 1" X 1/2" ANGLE.
14. C-CLAMP WITH RETAINING CLIP OR WITH LOCK NUT (OPTIONAL).
15. HANGING ROD.
16. RETAINING CLIP.
17. STRUCTURAL.

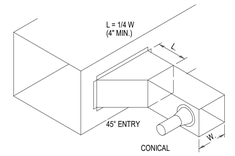
NOTE:
FOLLOW SMACNA GUIDELINES FOR DUCT SUPPORT.

03 DUCT SUPPORT

SCALE : NOT TO SCALE

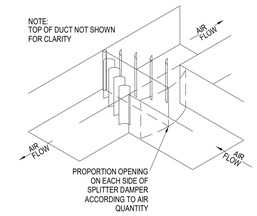
NOTES:

1. FIT ALL CONNECTIONS TO AVOID VISIBLE OPENINGS & SECURE SUITABLY FOR THE PRESSURE CLASS.
2. ADDITIONAL MECHANICAL FASTENERS REQ'D. FOR 4" W.G. & OVER.
3. DO NOT EXPOSE LINER EDGES ON LINED DUCT CONNECTIONS.
4. ALL OPENINGS TO BE CUT ACCURATELY IN SHAPE & SIZE.



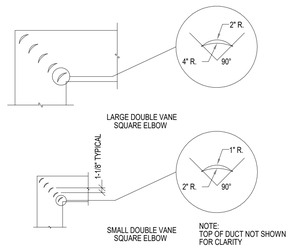
04 BRANCH CONNECTION DETAIL

SCALE: NOT TO SCALE



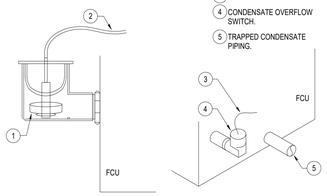
TYPICAL 05 SPLITTER DAMPER

SCALE : NOT TO SCALE



06 TYPICAL VANED DUCT ELBOWS DETAIL

SCALE: NO TO SCALE

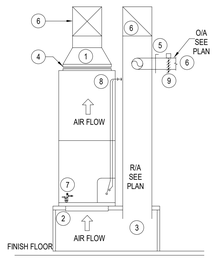


KEYED NOTES

1. FLOAT SWITCH.
2. INTERLOCK WITH FCU.
3. WIRING.
4. CONDENSATE OVERFLOW SWITCH.
5. TRAPPED CONDENSATE PIPING.

CONDENSATE 07 OVERFLOW SWITCH DETAIL

SCALE : NOT TO SCALE

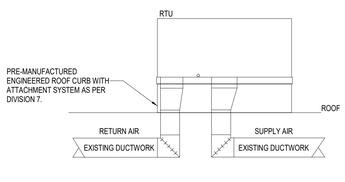


KEYED NOTES:

1. PROVIDE DUCTWORK TRANSITION.
2. PROVIDE FCU PLATFORM USING GALVANIZED STEEL ANGLE IRON WITH WELDED JOINTS. ENCLOSE PLATFORM USING 1" THICK MOISTURE RESISTANT PLYWOOD AND BOLT TO FRAMING WITH 1/4" GALVANIZED BOLTS. COORDINATE PLATFORM SIZE ON SITE. SET UNIT ON 1/2" NEOPRENE PAD ON PLATFORM. PLATFORM TO BE USED AS A RETURN AIR PLENUM AND BE SEALED AIRTIGHT.
3. TERMINATE DUCT INTO RETURN AIR PLENUM/FCU PLATFORM.
4. FLEX CONNECTOR.
5. MANUAL VOLUME DAMPER.
6. SEE PLANS FOR DUCT CONTINUATION.
7. SYMBOL IS DIAGRAMMATIC. COORDINATE CONDENSATE TRAP SIZE AND DEPTH WITH FCU SUPPLIER. PROVIDE INSULATED COPPER CONDENSATE DRAIN LINE ON UNISTRUT SLEEPERS, AND ROUTE LINE TO DRAIN RECEPTOR.
8. OPTIMIZE ROUTING OF REFRIGERANT PIPING AND COIL CONNECTIONS TO PREVENT BLOCKAGE OF UNITS ACCESS DOORS. ACCESS DOORS SHALL HAVE A CLEAR SWING FOR SERVICE.
9. MOTORIZED O/A DAMPER. INTERLOCK OPERATION WITH COMPRESSOR.

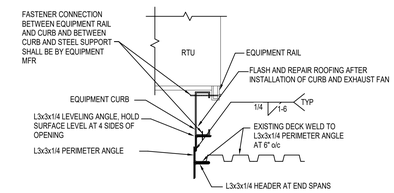
08 FCU SCHEMATIC DETAIL

SCALE: NOT TO SCALE



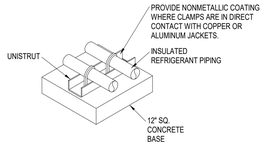
09 ROOFTOP UNIT DETAIL

SCALE : NOT TO SCALE



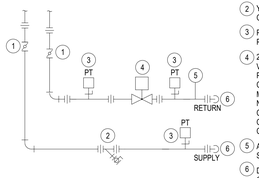
10 TYPICAL SUPPORT DETAIL

SCALE : NOT TO SCALE



REFRIGERANT PIPING 11 SUPPORT DETAIL

SCALE : NOT TO SCALE

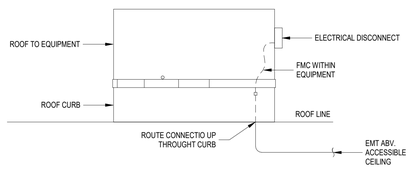


KEYED NOTES

1. 2-1/2" & LARGER BUTTERFLY VALVES FOR SHUTOFF. LINE SIZE: BALL VALVES FOR 2" AND BELOW
2. Y STRAINER WITH 3/4" BALL VALVE ON DISCHARGE
3. PRESSURE/TEMPERATURE TEST PLUG WITH COCK AND CAP
4. 2-WAY MODULATING DDC CONTROL VALVE WITH ELECTRIC ACTUATOR, PROVIDED BY CONTROLS CONTRACTOR INSTALLED BY MECHANICAL CONTRACTOR. PROVIDE NEMA 4X RATED ACTUATOR ON CHW CONTROL VALVE INSTALLED OUTDOORS. COORDINATE WITH CONTROLS CONTRACTOR.
5. AUTOMATIC AIR VENT W/MANUAL SHUT-OFF
6. DIELECTRIC STEEL/COPPER CONNECTION AT UNIT

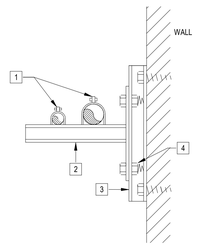
2-WAY VALVE CHILLED WATER COIL 12 CONNECTION SCHEMATIC (TYP.)

SCALE: NOT TO SCALE



RTU CONNECTION 13 DETAIL

SCALE: NOT TO SCALE

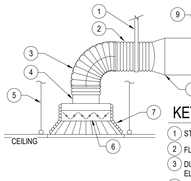


KEYED NOTES:

1. PROVIDE CONDUIT CLAMPS.
2. PROVIDE GALVANIZED UNISTRUT WALL BRACKET.
3. PROVIDE RAMSET OR BOLT GALVANIZED UNISTRUT TO WALL.
4. PROVIDE SELF HOLDING CLAMPING NUT WITH SPRING

RACEWAY RUNS 14 SUPPORT DETAIL

SCALE: NOT TO SCALE

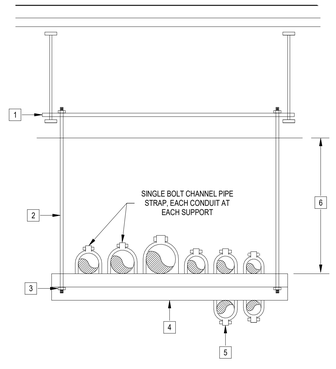


KEYED NOTES

1. STRAP HANGER.
2. FLEX SUPPLY DUCT, TYP.
3. DUCT COLLAR (TO RETAIN ELBOW SHAPE).
4. ROUND NECK ADAPTOR.
5. HANGER. TYP.
6. OPPOSED BLADE DAMPER (ALTERNATIVE), TYP.
7. INSULATION, TYP.
8. RECT. TO ROUND TRANSITION, TYP.
9. VOLUME DAMPER AT TAKE-OFF (PREFERED LOCATION), TYP.

CEILING DIFFUSER 15 SUPPORT

SCALE : NOT TO SCALE

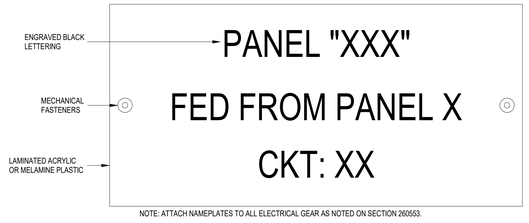


KEYED NOTES:

1. PROVIDE UNISTRUT STRUCTURAL CHANNEL SECURED TO JOIST AT BOTH ENDS.
2. PROVIDE 1/2" GALVANIZED ROD MINIMUM.
3. PROVIDE LOCKNUT
4. PROVIDE GALVANIZED UNISTRUT 8'-0" O/C MAXIMUM.
5. 0'-1" MAXIMUM SIZE ON BOTTOM OF UNISTRUT.
6. VARIES.

HORIZONTAL RACEWAYS 16 SUPPORT DETAIL

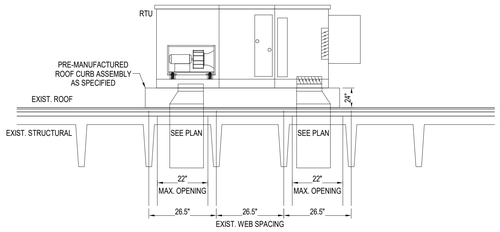
SCALE: NOT TO SCALE



NOTE: ATTACH NAMEPLATES TO ALL ELECTRICAL GEAR AS NOTED ON SECTION 260553.

EQUIPMENT 17 IDENTIFICATION LABEL DETAIL

SCALE: NOT TO SCALE



18 KITCHEN ROOFTOP UNIT SECTION DETAIL

SCALE : NOT TO SCALE

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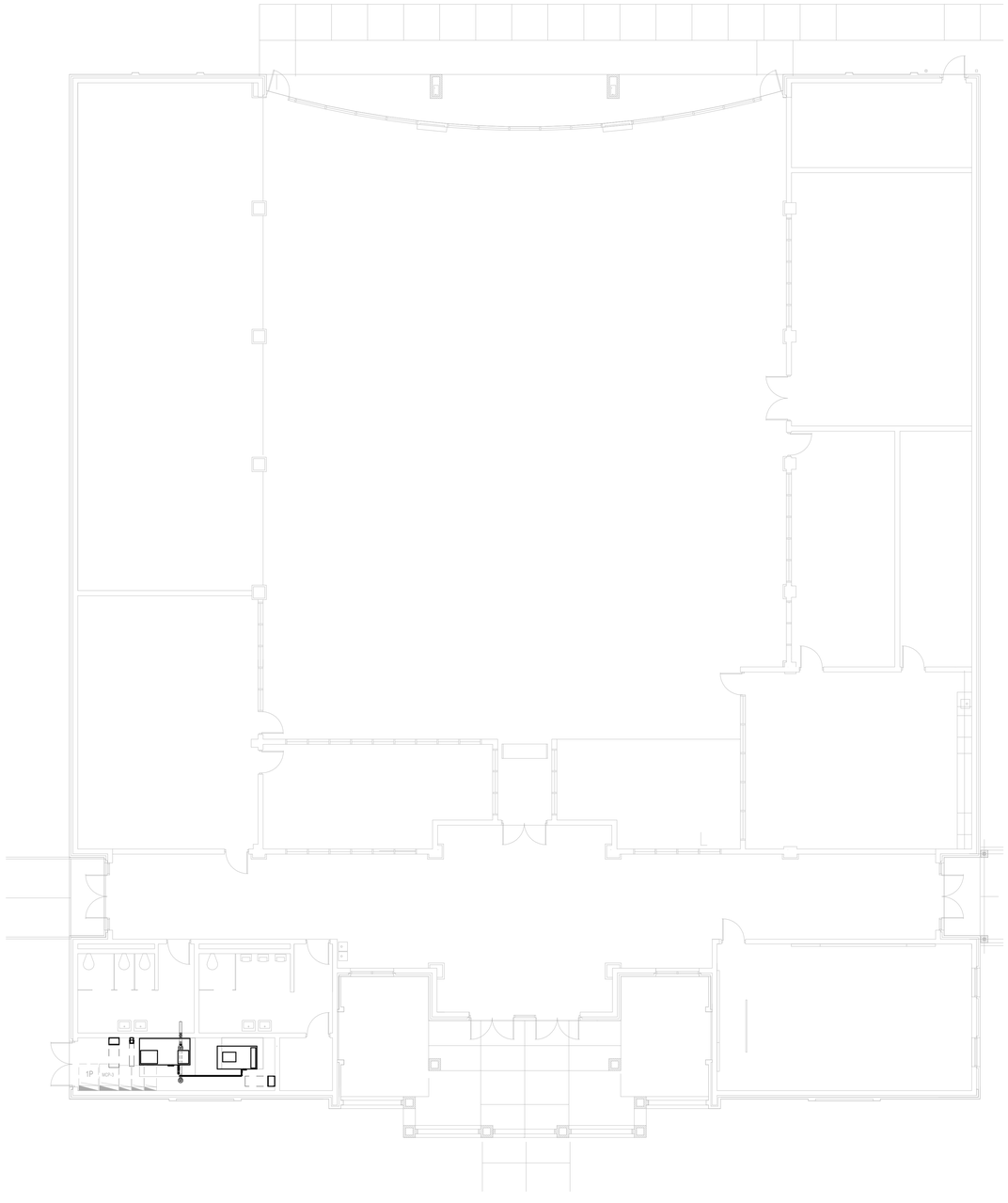
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CESAR A. GONZALEZ
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LICENSED PROFESSIONAL ENGINEER
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Project Architect: David Monreal, AIA
Drawn By: Author
Job No. 25V131
Sheet: ME9.01

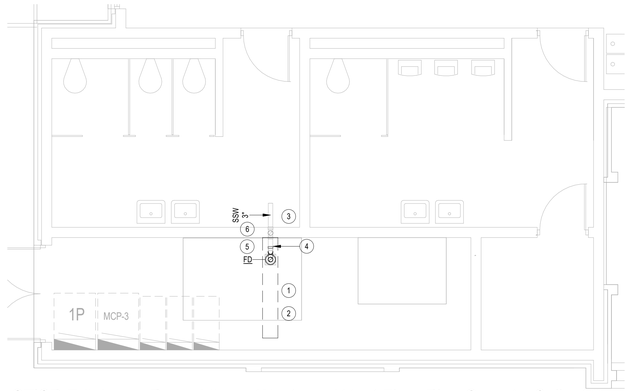
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1 STISD Edinburg - Demo Library Waste and Vent Floor Plan

SCALE: 1/8" = 1'-0"



2 STISD Edinburg - Demo Library Waste and Vent Floor Plan Copy 1 - Callout 2

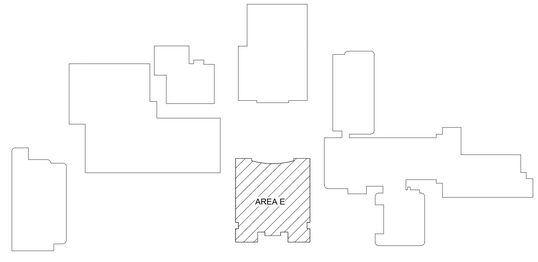
SCALE: 1/4" = 1'-0"

DEMOLITION GENERAL NOTES:

1. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PHASING REQUIREMENTS.
2. ALL DEMOLITION WORK SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE CODES INCLUDING THOSE PUBLISHED BY OSHA.
3. THE EXTENT AND REQUIREMENTS OF DEMOLITION WORK IS INDICATED ON THE ARCHITECTURAL DRAWINGS AND BY THE REQUIREMENTS OF THIS SECTION. A VISIT TO THE SITE IS REQUIRED TO PROPERLY BID THE DEMOLITION WORK. ALL INFORMATION SHOWN ON THE EXISTING CONSTRUCTION WILL BE REFERENCE ONLY AND WILL NEED TO BE FIELD VERIFIED BY THE CONTRACTOR.
4. PROVIDE ALL DEMOLITION WORK REQUIRED FOR THE REMOVAL OF EXISTING NON REUSED PLUMBING EQUIPMENT AND ASSOCIATED DEVICES. PROVIDE A COMPLETE AND OPERABLE SYSTEM UPON COMPLETION OF THE PROJECT.
5. COORDINATE DEMOLITION OF DIVISION 22 SYSTEM AS REQUIRED WITH ALL OTHER TRADES.
6. ALL EXISTING EQUIPMENT AND MATERIALS REMOVED DURING CONSTRUCTION, THAT IS NOT TO BE REUSED, SHALL BE REMOVED FROM THE JOB SITE AND PROPERLY RETURNED TO THE OWNER, IF DESIRED BY OWNER.
7. IT IS INTENDED THAT DEMOLITION WORK LEAVE THE ENTIRE AREA FREE OF ABOVE-GRADE ITEMS, INCLUDING PIPING, CONCRETE PADS, STRUCTURAL SUPPORTS MATERIALS AND MISCELLANEOUS ITEMS. ALL SUSCH ITEMS ARE TO BE REMOVED UNLESS SPECIFICALLY INDICATED OTHERWISE.
8. OWNER MAY WISH TO KEEP DEMOLISHED EQUIPMENT AND MATERIALS. COORDINATE WITH OWNER, AND DISPOSE OF EQUIPMENT AND MATERIALS THAT OWNER DOES NOT REMAIN.
9. PREPARE AREA FOR INSTALLATION OF NEW PLUMBING SYSTEMS. REFER TO NEW PLANS AND COORDINATE WITH DEMOLITION WORK.

PLUMBING DEMO KEYED NOTES:

1. PERFORM FLOOR TILE AND CONCRETE SLAB SAW CUTTING AND REPAIR AS NECESSARY TO ACCOMMODATE NEW PLUMBING FIXTURES. COORDINATE WITH DEMOLITION WORK. REFER TO NEW PLANS FOR MORE INFORMATION. COORDINATE WITH STRUCTURAL ENGINEER FOR SAW CUTTING INSTRUCTIONS.
2. REPAIR FLOOR TILE AND CONCRETE IN THE SAW CUTTING AREA. MATCH ARCHITECTURAL FINISH. REFER TO STRUCTURAL DETAILS FOR A REPAIR DETAIL.
3. APPROXIMATE LOCATION OF EXISTING SANITARY SEWER TO REMAIN. CONFIRM EXACT LOCATION PRIOR TO ANY WORK BEING DONE.
4. DISCONNECT EXISTING WASTE PIPE AT THIS APPROXIMATE POINT.
5. APPROXIMATE LOCATION OF EXISTING FLOOR DRAIN (FD) TO BE DEMOLISHED.
6. TRACE AND LOCATE EXISTING PIPING BEFORE PERFORMING SAW CUTTING WORK.



EDINBURG KEYPLAN

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STISD HVAC Project 26-27

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Drawn By:	MOV
Job No:	25V131
Sheet:	P2.01

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GENERAL NOTES:

1. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING A FULLY OPERATIONAL SYSTEM FOR NEW PLUMBING FIXTURES, INCLUDING SANITARY SEWER AND DOMESTIC WATER SUPPLY LINES.
2. CONTRACTOR SHALL ENSURE THAT ANY EXISTING PLUMBING FIXTURES DESIGNATED TO REMAIN ARE FULLY FUNCTIONAL AND PROPERLY CONNECTED TO THE SANITARY SEWER AND DOMESTIC COLD AND HOT WATER SYSTEMS.
3. PRIOR TO PERFORMING THE INSTALLATION OF NEW SANITARY SEWER PIPING, CONTRACTOR SHALL FIELD-VERIFY THE EXISTING SANITARY SEWER INVERTED ELEVATIONS TO ENSURE THAT NEW SEWER PIPING CAN BE INSTALLED PROPERLY. CONTRACTOR SHALL NOTIFY THE A/E TEAM IF INVERT ELEVATIONS DO NOT WORK WITH THE NEW SEWER PIPING SLOPE.

WASTE AND VENT KEYED NOTES:

1 CONNECT EXISTING WASTE PIPING TO NEW WASTE PIPING AT THIS APPROXIMATE POINT.

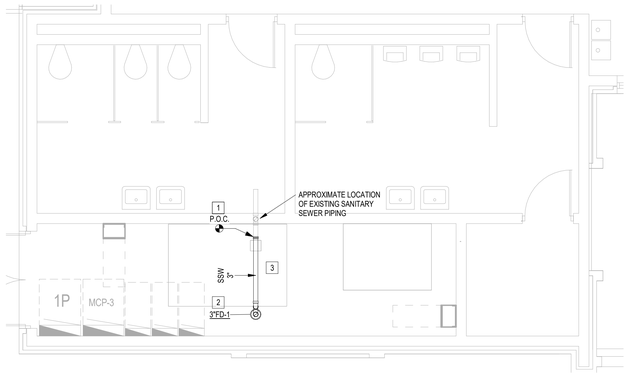
2 PROVIDE FLOOR DRAIN AS SCHEDULED. SET FLUSH WITH FINISHED FLOOR. REFER TO ASSOCIATED DETAIL ON DETAIL SHEET.

3 REFER TO STRUCTURAL DRAWINGS FOR CONCRETE SLAB DEMOLITION AND REPAIR DETAILS.



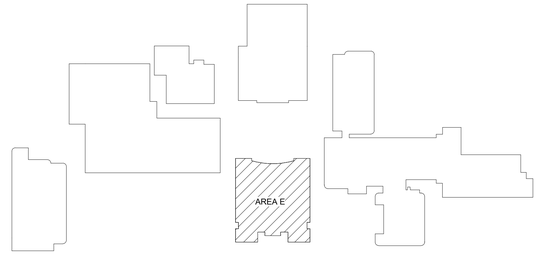
1 STISD Edinburg - Reno Library Waste and Vent Floor Plan

SCALE: 1/8" = 1'-0"



2 STISD Edinburg - Reno Library Enlarged Waste and Vent Floor Plan

SCALE: 1/4" = 1'-0"



EDINBURG KEYPLAN

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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

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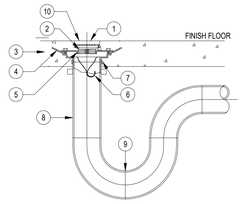
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Project Architect:	David Monreal, AIA
Drawn By:	MOV
Job No:	25V131
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PLUMBING FIXTURE SCHEDULE

Project: STISD HVAC Project 26-27

MARK	MANUFACTURER & MODEL NUMBER	DESCRIPTION	CONNECTIONS					REMARKS
			WASTE	VENT	CW	HW	NOTES	
FD-1	ZURN # Z415I-ZN PROSET TRAP GUARD #TG-33-Z	FLOOR DRAIN BODY ASSEMBLY WITH TYPE I STRAINER, DURA COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE COLLAR WITH SEEPAGE SLOTS. POLISHED NICKEL BRONZE TOP AND WITH TRAP GUARD.	3"	2"	-	-	-	



KEYED NOTES

1. STRAINER.
2. ADJUSTABLE DRAIN HEAD.
3. CONRETE.
4. MEMBRANE.
5. FLASHING COLLAR.
6. PROVIDE PROSET TRAP GUARD OR APPROVED EQUAL.
7. S.S. "NO-HUB" ASSEMBLY.
8. PIPE SIZE AS INDICATED ON PLAN.
9. DEEP SEAL P-TRAP.
10. SET EXTENEDED RIM FLUSH WITH FINISHED FLOOR.

01 FD-1
FLOOR DRAIN WITH TRAP GUARD DETAIL
SCALE: NOT TO SCALE

GENERAL NOTES:

(APPLY TO ALL PLUMBING SHEETS)

1. ALL PLUMBING WORK SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AS ADAPTED AND AMENDED BY THE INSPECTING AUTHORITIES.
2. DRAWING IS DIAGRAMMATIC ONLY. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF PIPING, DEVICES AND EQUIPMENT WITH BUILDING ELEMENTS AND THE WORK OF OTHER TRADES.
3. ALL PLUMBING WORK SHALL BE INSTALLED SO AS TO AVOID CONFLICT WITH THE WORK OF OTHER TRADES. COORDINATE WITH MECHANICAL, ELECTRICAL AND STRUCTURAL FOR PROPER CLEARANCES.
4. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR PHASING AND SEQUENCE OF CONSTRUCTION WORK.
5. COORDINATE WORK AMONG ALL DISCIPLINES. IT IS NOT THE INTENT OF THESE DOCUMENTS TO DICTATE WHO MUST DO THE WORK. ALL WORK SHOWN IS THE RESPONSIBILITY OF THE PRIME CONTRACTOR.
6. REFER TO PLUMBING FIXTURE ROUGH-IN SCHEDULE FOR INDIVIDUAL PIPE CONNECTIONS TO FIXTURES.
7. STUDS AT DRY WALLS SHALL NOT BE CUT THRU HORIZONTAL DIRECTION. COORDINATE WITH DRY WALL CONTRACTOR.
8. COORDINATE FLOOR DRAIN/ SINKS FINAL LOCATIONS WITH STRUCTURAL CONTRACTOR.

PLUMBING SYMBOLS LEGEND

	COLD WATER SUPPLY (CW)	A.F.F.	ABOVE FINISH FLOOR
	HOT WATER SUPPLY (HW)	GT	GREASE TRAP
	GAS LINE (GAS)	S.S.W.	SANITARY SEWER
	SOIL & WASTE LINE	WC	WATER CLOSET
	VENT LINE (V)	UR	URINAL
	PRIMARY STORM SEWER LINE (PSS)	P.O.C.	POINT OF CONNECTION
	SECONDARY STORM SEWER LINE (SSS)	L	LAVATORY
	RE-CIRCULATING HOT WATER LINES (RHW)	SK	SINK
	FIRE RISER LINE (FR)	EDF	ELECTRIC DRINKING FOUNTAIN
	EXISTING FIRE RISER LINE (FR)	MSB	MOP SERVICE BASIN
FCO	FLOOR CLEANOUT	SHR	SHOWER
FD	FLOOR DRAIN (FD) WITH DEEP SEAL TRAP	TP	TRAP PRIMER
FS	FLOOR SINK (FS) WITH DEEP SEAL TRAP	EWH	ELECTRIC WATER HEATER
HD	HUB DRAIN WITH DEEP SEAL TRAP	VTR	VENT THRU ROOF
YCO-2	YARD CLEANOUT - 2 WAY	CO	CLEANOUT
	WALL HYDRANT (WH)	EESHR	EMERGENCY EYE/SHOWER
	*WATER HAMMER ARRESTOR (WHA)		QUAZITE BOX WITH GATE VALVE
	WYE FITTING		SECTION VIEW CUT
	45° ELBOW FITTING	GWH	GAS WATER HEATER
	90° ELBOW FITTING	PSS	PRIMARY STORM SEWER
	GAS METER	SSD	SECONDARY STORM SEWER
	BALL VALVE (BV)		

* PROVIDE 12"x12" ACCESS PANEL WHERE INSTALLED IN AN INACCESSIBLE AREA.

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STISD HVAC Project 26-27

MERCEDES, OLMITO, & EDINBURG, TEXAS

STATE OF TEXAS
CESAR A. GONZALEZ
108611
LICENSED PROFESSIONAL ENGINEER
07.31.2026

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Gomez Mendez Saenz Inc.
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GENERAL STRUCTURAL NOTES

THESE GENERAL NOTES SHALL APPLY UNLESS OTHERWISE SPECIFICALLY NOTED ON PLANS OR DETAILS. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SHALL COORDINATE ALL STRUCTURAL PLANS AND DETAILS WITH ARCHITECTURAL & MECHANICAL DRAWINGS BEFORE STARTING WORK. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR CONTRACTOR MEANS AND METHODS OF CONSTRUCTION OR SITE SAFETY. DESIGN, CONSTRUCTION, WORKMANSHIP AND MATERIALS SHALL COMPLY WITH THE CONTROLLING PROVISIONS OF THE 2024 EDITION OF THE **INTERNATIONAL BUILDING CODE (IBC).**

DESIGN CRITERIA

1. BASIS FOR DESIGN AND CODE COMPLIANCE

   A. GOVERNING BUILDING CODE....................2024

2. WIND DESIGN BASED ON:

   A. ASCE 7-22 REQUIREMENTS FOR EDINBURG, TX
   BASIC DESIGN WIND SPEED....................137 MPH (Vasd=107 MPH)
   RISK CATEGORY....................III
   WIND EXPOSURE CATEGORY....................C
   INTERNAL PRESSURE COEFFICIENT (GCpi)....................±0.18
   Kzt....................1.0
   Kd....................0.85
   Ke....................1.0

   B. ASCE 7-22 REQUIREMENTS FOR OLMITO, TX
   BASIC DESIGN WIND SPEED....................158 MPH (Vasd=123 MPH)
   RISK CATEGORY....................III
   WIND EXPOSURE CATEGORY....................C
   INTERNAL PRESSURE COEFFICIENT (GCpi)....................±0.18
   Kzt....................1.0
   Kd....................0.85
   Ke....................1.0

3. GRAVITY DESIGN
   A. ROOF:
   DEAD LOAD....................SELF-WEIGHT OF STRUCTURE & ROOFING SYSTEM
   LIVE LOAD....................20 PSF (REDUCIBLE)

4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL TDI WINDSTORM FIELD INSPECTIONS AND WINDSTORM CERTIFICATION OF ALL BUILDINGS. CONTRACTOR SHALL REFERENCE SPEC. 011100.

PROJECT WINDSTORM REQUIREMENTS

1. THE GENERAL CONTRACTOR MUST SUBMIT COMPONENT AND CLADDING WIND PRESSURE RATINGS AND REQUIRED ATTACHMENT PROCEDURES TO THE TEXAS DEPARTMENT OF INSURANCE (TDI) APPOINTED QUALIFIED INSPECTOR (WINDSTORM INSPECTOR) FOR REVIEW. SUBMITTAL INFORMATION SHALL INCLUDE DOCUMENTATION FOR EITHER A TESTED ASSEMBLY (THIRD PARTY WIND TEST REPORT) OR AN ENGINEERED ASSEMBLY (ENGINEERED SHOP DRAWINGS AND CALCULATIONS SEALED BY A TEXAS PROFESSIONAL ENGINEER) OF THE PROPOSED ASSEMBLY.
2. THE GENERAL CONTRACTOR SHALL CONTACT THE WINDSTORM INSPECTOR TO COORDINATE AND SCHEDULE REQUIRED PERIODIC INSPECTIONS OF THE INSTALLATION OF THE EXTERIOR COMPONENTS AND CLADDINGS.
3. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING CONSTRUCTION SERVICES AS NEEDED TO SATISFY THE REQUIREMENTS OF THE CONSTRUCTION DRAWINGS AND SPECIFICATIONS, THE REFERENCED BUILDING CODE AND THE TEXAS DEPARTMENT OF INSURANCE WINDSTORM INSPECTION PROGRAM. ALL CONSTRUCTION ADMINISTRATION COSTS ASSOCIATED WITH SUBMITTAL PREPARATION, SUBMITTAL REVIEW, INSPECTION COORDINATION, INCLUDING ALL GENERAL CONDITIONS, OVERHEAD AND PROFIT, SHALL BE INCLUDED IN THE GENERAL CONTRACTOR'S BID.
4. FOR THE NEW EXTERIOR MECHANICAL EQUIPMENT AND EXPOSED EXTERIOR DUCTWORK, THE ENGINEERING DESIGN FOR THESE EXTERIOR ASSEMBLIES, INCLUDING THEIR SUPPORT COMPONENTS (CURBS, STANDS, SLEEPERS, ETC.) AND ANCHORING OF THESE ITEMS TO THE STRUCTURE, SHALL BE SPECIFIED AS A DELEGATED DESIGN TO BE PERFORMED BY THE EQUIPMENT AND DUCTWORK MANUFACTURER. HENCE, THIS RESPONSIBILITY FALLS ON THE GENERAL CONTRACTOR, THEIR SUBCONTRACTORS AND THEIR VENDORS. NEITHER THE STRUCTURAL ENGINEER OR WINDSTORM INSPECTOR IS RESPONSIBLE FOR DESIGNING THE ROOFTOP EQUIPMENT ASSEMBLIES OR DUCTWORK, NOR OF THE ANCHORING OF THESE ASSEMBLIES TO THE STRUCTURE. SUBMITTALS OF THE ENGINEERED ASSEMBLIES NEED TO BE PROVIDED BY THE GENERAL CONTRACTOR FOR REVIEW AND FOR USE IN PERFORMING THE FIELD INSPECTIONS.

FOUNDATION DESIGN CRITERIA

1. FOUNDATION DESIGN IS IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE, AND IS BASED ON ASSUMED GEOTECHNICAL PROPERTIES.

   A. BEARING CAPACITY:
   GRADE BEAMS & CONTINUOUS FOOTINGS (TOTAL LOAD) ....1.6 KSF

   B. POTENTIAL VERTICAL RISE (PVR) ....1.0 INCH

2. GROUNDWATER IS ASSUMED TO BE ENCOUNTERED AT 8'-0" BELOW EXISTING GRADE (MAY FLUCTUATE WITH SEASON). CONTRACTOR SHALL DETERMINE ACTUAL GROUNDWATER LEVELS JUST PRIOR TO CONSTRUCTION EXCAVATION ACTIVITIES.
3. A GEOTECHNICAL ENGINEER OF RECORD SHALL BE RETAINED TO PERFORM TESTING AND INSPECTIONS DURING SITE PREPARATION AND PLACEMENT OF BUILDING PAD FILL AS REQUIRED BY SPECIFICATIONS AND GENERAL STRUCTURAL NOTES.

HAZARDOUS MATERIALS ABATEMENT/ MANAGEMENT

1. THE ENGINEER HAS NO RESPONSIBILITY OR LIABILITY FOR DESIGN, REMOVAL OF, OR TESTING FOR ASBESTOS/LEAD, OR FOR ABATEMENT /MANAGERIAL TREATMENTS, MONITORING, AND LEGAL DISPOSAL OF MATERIALS. CONTRACTOR SHALL DETERMINE IF ANY HAZARDOUS MATERIAL ABATEMENT/ MANAGEMENT IS REQUIRED AND SHALL INCLUDE COSTS THEREOF IN THE BID.

CONSTRUCTION NOTES ON THE REPAIR WORKS ON EXISTING STRUCTURE

1. BEFORE PROCEEDING WITH ANY WORK WITHIN THE EXISTING FACILITY. THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH EXISTING STRUCTURAL AND OTHER CONDITIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL NECESSARY BRACING. SHORING AND OTHER SAFEGUARDS TO MAINTAIN ALL PARTS OF THE EXISTING WORK IN A SAFE CONDITION DURING THE PROCESS OF DEMOLITION AND CONSTRUCTION AND TO PROTECT FROM DAMAGE THOSE PORTIONS OF THE EXISTING WORK WHICH ARE TO REMAIN.
2. THE CONTRACTOR SHALL FIELD VERIFY THE DIMENSIONS. ELEVATIONS, ETC. NECESSARY FOR THE PROPER CONSTRUCTION AND ALIGNMENT OF THE NEW PORTIONS OF THE WORK TO THE EXISTING WORK. THE CONTRACTOR SHALL MAKE ALL MEASUREMENTS NECESSARY FOR FABRICATION AND ERECTION OF STRUCTURAL MEMBERS. ANY DISCREPANCY SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. WELDING TO AND WITHIN AN EXISTING FACILITY PRESENTS POTENTIAL HAZARDS INCLUDING:

   A. FIRE HAZARD - DUE TO THE EXISTING CONSTRUCTION AND BUILDING CONTENTS.

   B. STRUCTURAL LIQUEFACTION - DUE TO WELDING ACROSS THE FULL SECTION OF STRUCTURAL STEEL MEMBERS.

   RECOMMENDATIONS TO PREVENT THESE HAZARDS INCLUDE.

   A. FIRE HAZARD - PROTECT EXISTING COMBUSTIBLES PRIOR TO WELDING. KEEP A SEPARATE WATCHMAN AND SEVERAL FIRE EXTINGUISHERS ON HAND.

   B. STRUCTURAL LIQUEFACTION - WELD IN SMALL INCREMENTS. ALLOW WELDS TO HARDEN BEFORE CONTINUING TO THE NEXT INCREMENT.

   C. DO NOT LEAVE THE SITE UNTIL SATISFIED THAT NO FIRE HAZARD EXISTS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND ERECTION OF ALL SHORING NECESSARY TO SAFEGUARD THE EXISTING STRUCTURE.

EXISTING CONDITIONS

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS. DIMENSIONS SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR SHALL OBTAIN ALL FIELD MEASUREMENTS AS NECESSARY TO COORDINATE NEW CONSTRUCTION TO EXISTING CONDITIONS.
2. IF EXISTING CONDITIONS DIFFER FROM THE DRAWINGS, INFORM THE ENGINEER AND ADDITIONAL DETAILS OR INTERPRETATION WILL BE PROVIDED. DO NOT PROCEED WITHOUT VERIFICATION.
3. THE CONTRACTOR SHALL VISIT THE SITE OF THE PROPOSED WORK AND FULLY ACQUAINT THEMSELVES WITH THE EXISTING CONDITIONS.

DEMOLITION NOTES

1. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE EXISTING STRUCTURE AND SURROUNDING BUILDINGS DURING CONSTRUCTION.
2. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY WATERTIGHTNESS OF THE BUILDING DURING DEMOLITION AND RECONSTRUCTION.
3. GENERAL CONTRACTOR SHALL COORDINATE WITH ENGINEER ITEMS THAT ARE UNCLEAR PRIOR TO ANY DEMOLITION.
4. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE PROJECT SITE TO DETERMINE DEMOLITION REQUIREMENTS AT THIS PROJECT. CONTRACTOR SHALL INCLUDE IN THEIR BID ALL THE DEMOLITION REQUIREMENTS TO COMPLETE THIS PROJECT.
5. GENERAL CONTRACTOR SHALL LOCATE AND LABEL ALL UTILITIES BEFORE COMMENCEMENT OF DEMOLITION & CONSTRUCTION ACTIVITIES. UTILITIES SHALL BE CLEARLY MARKED SO THAT ANY SUBCONTRACTOR VISITING THIS SITE CAN EASILY IDENTIFY UTILITIES. ANY COSTS TO REPAIR DAMAGES IF UTILITIES ARE NOT PROPERLY IDENTIFIED, ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
6. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING DEBRIS & MATERIAL AWAY FROM SITE ACCORDING TO GOVERNING LOCAL, STATE OR FEDERAL REGULATIONS.
7. ANY AREA DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.

PENETRATIONS

1. PENETRATIONS THROUGH EXISTING ELEMENTS SHALL COMPLY WITH THE DRAWINGS AND SPECIFICATIONS.
2. DO NOT CUT JOISTS, BEAMS OR COLUMNS WITHOUT PRIOR APPROVAL.
3. PENETRATIONS THROUGH LOAD-BEARING ELEMENTS SHALL BE TEMPORARILY SHORED TO PREVENT COLLAPSE, AS SPECIFIED BELOW.

TEMPORARY BRACING, FALSEWORK AND FORMWORK

1. CONTRACTOR SHALL PROVIDE ENGINEERED SHORING PLAN PRIOR TO START OF ROOF COLUMN DEMOLITION. SHORING PLAN SHALL BE SIGNED AND SEALED BY A STATE OF TEXAS PROFESSIONAL ENGINEER.
2. THE DESIGN, ENGINEERING, FABRICATION, CONSTRUCTION, ERECTION, REMOVAL AND OVERALL SAFETY OF ALL TEMPORARY SUPPORTS SUCH AS FALSEWORK, FORMWORK, SHORES AND BRACING REQUIRED FOR THE EXECUTION OF THE CONTRACT ARE NOT INCLUDED IN THE DRAWINGS AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. THE ENGINEER'S EFFORTS ARE AIMED AT DESIGNING A PROJECT WHICH WILL BE SAFE AFTER FULL COMPLETION. THE ENGINEER HAS NO EXPERIENCE IN, AND TAKES NO RESPONSIBILITY FOR, CONSTRUCTION MEANS AND METHODS OR JOB SITE SAFETY DURING CONSTRUCTION. SAFETY IS EXCLUSIVELY THE CONTRACTOR'S RESPONSIBILITY. PROCESSING AND/OR APPROVING SUBMITTALS MADE BY CONTRACTOR WHICH MAY CONTAIN INFORMATION RELATED TO SHORING, CONSTRUCTION METHODS OR SAFETY ISSUES, OR PARTICIPATION IN MEETINGS WHERE SUCH ISSUES MIGHT BE DISCUSSED, MUST NOT BE CONSTRUED AS VOLUNTARY ASSUMPTION BY ENGINEER OF ANY RESPONSIBILITY FOR THESE SAFETY PROCEDURES.

SAFETY

1. PERFORM ALL WORK IN A SAFE AND CONSCIENTIOUS MANNER TO PREVENT INJURIES.
2. CONTRACTOR SHALL MAINTAIN OSHA STANDARDS FOR JOB SAFETY AND WORKER PROTECTION, INCLUDING, BUT NOT LIMITED TO ADEQUATE PROTECTION, BARRICADES, SIGNS, ETC.
3. THE GENERAL CONTRACTOR IS SOLELY RESPONSIBLE FOR SAFETY. THE ENGINEER EXPRESSLY EXCLUDES ANY RESPONSIBILITY FOR CONTRACTOR SAFETY OR SAFETY OF JOBSITE.

CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE SPECIFICATION, A.C.I. #301 AND BUILDING CODE REQUIREMENTS, A.C.I. #318, LATEST EDITION.
2. ALL DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS, UNLESS OTHERWISE NOTED, MUST FOLLOW THE A.C.I. "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE", A.C.I. #315, LATEST EDITION.
3. CONCRETE SHALL HAVE A MINIMUM COMPRESSION STRENGTH OF 3,000 PSI AT 28 DAYS.
4. A MAXIMUM OF 25% FLYASH MAY BE USED AS A CEMENT SUBSTITUTE AND SHALL CONFORM TO ASTM C618, CLASS C. THE WATER/CEMENT RATIO SHALL NOT EXCEED 0.6 AND SLUMPS SHALL BE 5 INCHES (±1 INCH). AGGREGATE SHALL BE WELL-GRADED, 1" MAXIMUM FOR THE SLAB ON GRADE, 1" MAXIMUM FOR CAST-IN-PLACE BEAMS AND ABOVE GRADE SLABS. COARSE AGGREGATE SHALL MEET ASTM C33, GRADATION #57. A QUALIFIED TESTING LABORATORY SHALL BE RETAINED TO FURNISH MIX DESIGNS FOR ALL CLASSES OF CONCRETE. A SAMPLE OF FOUR CYLINDERS SHALL BE TAKEN NOT LESS THAN ONCE A DAY, NOR LESS THAN ONCE FOR EACH 100 YD3 OF CONCRETE. ONE CYLINDER SHALL BE TESTED AT 7 DAYS AND TWO AT 28 DAYS. THE FOURTH CYLINDER MAY BE DISPOSED OF AFTER 45 DAYS IF NOT USED.
5. ADMIXTURES CONTAINING WATER SOLUBLE CHLORIDE IONS GREATER THAN 0.06% BY WEIGHT OF CEMENT SHALL NOT BE USED.
6. REINFORCING BARS SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A-615, GRADE 60. #3 BARS MAY BE GRADE 40.
7. STANDARD PROTECTIVE COVER OF REINFORCING BARS UNLESS OTHERWISE NOTED SHALL BE:

   WHERE CAST AGAINST DIRT OR FILL .... 3 IN.
   EXPOSED TO EARTH OR WEATHER .... 2 IN.
   SLABS AND WALLS .... 1 IN.
   OTHER .... 1-1/2 IN.

8. ALL ACCESSORIES SHALL BE IN ACCORDANCE WITH THE A.C.I. "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE", A.C.I. #315, LATEST EDITION.
9. SLAB MAT TO BE SUPPORTED BY MASONRY BRICK BATTS (MIN OF 1/2 BRICK) SPACED AT 4 FEET ON CENTER EACH WAY (MAX). BEAM CAGES SUPPORTED BY BATTS AT 4 FEET ON CENTER.
10. MAINTAIN A MINIMUM OF ONE AND ONE-HALF (1-1/2) TIMES THE MAXIMUM COARSE AGGREGATE SIZE BETWEEN ALL REINFORCING BARS (EXCEPT AT LAPS).
11. BARS SCHEDULED OR DETAILED "CONT" SHALL BE LAPPED 40 BAR DIAMETERS (24 INCHES MINIMUM) UNLESS OTHERWISE NOTED.
12. WHERE CONCRETE IS TO HAVE UNEXPOSED SURFACES, THE FORMS MAY BE CONSTRUCTED OF #2 LUMBER OR BETTER. WHERE SURFACES ARE EXPOSED, SUCH AS FOR FINISH PAINTING OR STUCCO DASH, THE FORMS SHALL BE COMMERCIAL STANDARD DOUGLAS FIR, MOISTURE-RESISTANT CONCRETE FORM PLYWOOD; MINIMUM 5-PLY AND AT LEAST 9/16" THICK, OR FORMS LINED WITH COMMERCIAL STANDARD DOUGLAS FIR, CONCRETE FORM EXTERIOR, 3-PLY, NOT LESS THAN 1/4" THICK. WHERE CONCRETE IS EXPOSED, A SMOOTH SURFACE IS REQUIRED, FREE FROM FINS, HONEYCOMB, FORM MARKS OR OTHER DEFECTS.
13. EXPOSED SURFACES OF CONCRETE AT THE PERIMETER OF THE FOUNDATION SHALL BE FORMED WITH 2X10 #2 LUMBER OR BETTER. A SMOOTH SURFACE IS REQUIRED, FREE FROM FINS, HONEYCOMB, FORM MARKS OR OTHER DEFECTS.
14. CONSTRUCT FORMS SO THAT JOINTS ARE LEAKPROOF. MAINTAIN FORMS SUFFICIENTLY RIGID TO PREVENT DEFORMATION UNDER LOAD.
15. CONCRETE MAY BE PLACED WITH CHUTES UP TO 25' MAXIMUM. SLUMP SHALL NOT EXCEED 6" AT TRUCK DISCHARGE POINT.
16. CONCRETE PLACED BY PUMPING SHALL MEET THE FOLLOWING REQUIREMENTS:

    A. COARSE AGGREGATE SHALL BE GRADED FROM A MAXIMUM OF 1" DOWN

    B. MAXIMUM ALLOWABLE INCREASE IN CEMENT FACTOR SHALL BE 1/2 SACK PER CUBIC YARD OVER NORMAL MIX DESIGN.

    C. MAXIMUM WATER CEMENT RATIO SHALL BE 7-1/2 GALLONS PER SACK OF CEMENT. IF MORE WORKABILITY IS REQUIRED, AN ADMIXTURE MAY BE USED.

    D. MAXIMUM WEIGHT RATIO OF FINE AGGREGATES TO COARSE AGGREGATES SHALL NOT EXCEED 2/3.

    E. REFER TO A.C.I. #301, LATEST EDITION, SECTION 800, FOR OTHER PUMPING REQUIREMENTS.

    F. IN NO CASE SHALL CONCRETE BE PUMPED THROUGH AN ALUMINUM TUBE.

    G. SLUMP SHALL NOT EXCEED 6" AT TRUCK DISCHARGE POINT.

17. FLOOR FINISH (TOLERANCES)

    A. STEEL TROWEL FINISH 1/8" IN 10'

    B. FLOAT FINISH 1/4" IN 10'

    C. SCRATCH FINISH 1/2" IN 10'

18. CONCRETE TO BE CURED IN ACCORDANCE WITH ACI RECOMMENDATIONS. PROPOSED METHOD OF CURING TO BE COORDINATED WITH ENGINEER PRIOR TO CONCRETE PLACEMENT.
19. SHOP DRAWINGS SHALL BE PREPARED FOR ALL REINFORCING STEEL AND SUBMITTED FOR REVIEW BY ENGINEER. SUBMITTALS SHALL INCLUDE ELECTRONIC (PDF) COPIES OF EACH DRAWING. ENGINEERING DRAWINGS SHALL NOT BE REPRODUCED AND USED AS SHOP DRAWINGS.
20. THE CONTRACTOR SHALL REVIEW AND ANNOTATE SHOP DRAWINGS BEFORE SUBMITTING THEM TO THE ARCHITECT/ENGINEER FOR REVIEW. THE CONTRACTOR SHALL ALLOW ARCHITECT/ENGINEER 10 WORKING DAYS FOR REVIEW OF SHOP DRAWINGS.
21. ENGINEER TO BE NOTIFIED 48 HOURS PRIOR TO PLACEMENT OF FOUNDATION AND OF STRUCTURAL CONCRETE TO SCHEDULE REQUIRED OBSERVATIONS.

STRUCTURAL STEEL

1. TOP OF BEAM/PLATE (TOB OR TOP) IS USED INTERCHANGEABLY ON PLANS. REFERENCE APPLICABLE SECTION FOR CLARIFICATION.
2. STRUCTURAL STEEL WIDE FLANGE MEMBERS SHALL CONFORM TO ASTM SPECIFICATION A 572 AND/OR ASTM A 992 (Fy = 50 KSI) UNLESS OTHERWISE SHOWN OR NOTED. PLATE AND ANGLES MAY BE A36 (Fy = 36 KSI).
3. ALL STRUCTURAL STEEL TUBING SHALL CONFORM TO ASTM SPECIFICATION A-500, GRADE B (Fy=46 KSI). STEEL PIPE SHALL COMPLY WITH ASTM A53 TYPE E OR S (Fy=35 KSI).
4. ALL STRUCTURAL STEEL SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION.
5. ALL BOLTS SHALL BE 3/4 DIAMETER ASTM A325. WASHERS SHALL BE PROVIDED AT OVERSIZED HOLES AND AT SLOTTED CONNECTIONS AT EXPANSION JOINTS. A325 CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS UNLESS NOTED OTHERWISE. ANCHOR BOLTS MAY BE ASTM A307 UNLESS NOTED OTHERWISE.
6. REFER TO MANUFACTURER & MECHANICAL PLANS FOR VERIFICATION OF ALL BOLTS, BLOCKING ANCHORS, ETC., FOR THE ANCHORAGE OF THEIR RESPECTIVE ITEMS.
7. ALL BEAMS SHALL BE FULL LENGTH WITHOUT SPLICES UNLESS INDICATED ON PLANS OR APPROVED BY THE ENGINEER IN WRITING.
8. ALL SHOP AND FIELD WELDS SHALL BE MADE BY WELDERS WHO HAVE BEEN QUALIFIED AND CERTIFIED TO MAKE THE REQUIRED WELDS IN ACCORDANCE WITH THE LATEST AMERICAN WELDING SOCIETY SPECIFICATIONS (A.W.S. D-1.1).
9. WELDS SHALL BE MADE WITH COVERED MILD STEEL ELECTRODES COMPLYING WITH AWS D1 72 CODE AND SERIES E 70XX.
10. ERECTION CONNECTORS SHALL BE PROVIDED IN ORDER TO PROPERLY ALIGN AND BE TRUE AND PLUMB WHEN WELDS ARE MADE.
11. ALL COMPLETE PENETRATION WELDS, BOTH SHOP AND FIELD, SHALL BE TESTED BY A QUALIFIED TESTING LABORATORY UTILIZING ULTRA SONIC TESTING PROCEDURES IN ACCORDANCE WITH A.W.S. D-1.1. ANY WELDS FOUND DEFECTIVE SHALL BE REMOVED AND REPLACED AT NO ADDITIONAL COST TO THE OWNER. ALL X-RAYED WELDS SHALL BE GROUND SMOOTH.
12. THE FABRICATOR SHALL SUPPLY BACK-UP PLATES AND EXTENSION TABS FOR ALL COMPLETE PENETRATION WELDS.
13. ALL STEEL MEMBERS, UNLESS NOTED OTHERWISE, SHALL BE HOT DIPPED GALVANIZED. DO NOT PRIME ITEMS TO BE EMBEDDED IN CONCRETE OR FIRE PROOFED W/ SPRAY ON MATERIAL WITHOUT COORDINATION W/ MECHANICAL ENGINEER.

STRUCTURAL STEEL CONTINUED:

14. AFTER ERECTION, PRIME WELDS, ABRASIONS AND SURFACES NOT PRIMED. USE PRIMER CONSISTENT WITH SHOP COAT. GALVANIZED SURFACES (HOT DIPPED OR COLD) SHALL BE CLEANED AND PAINTED WITH "ZRC".
15. FIELD WELDS AND BOLTED CONNECTIONS SHALL BE VISUALLY INSPECTED BY A QUALIFIED INDEPENDENT INSPECTOR. THE INSPECTOR SHALL PROVIDE A WRITTEN REPORT TO THE STRUCTURAL ENGINEER.
16. A SINGLE ELECTRONIC FILE (PDF FORMAT) SHOP DRAWINGS SHALL BE PREPARED FOR ALL STRUCTURAL STEEL COMPONENTS AND SUBMITTED FOR REVIEW BY ENGINEER. ENGINEERING DRAWINGS SHALL NOT BE REPRODUCED AND USED AS SHOP DRAWINGS.
17. THE CONTRACTOR SHALL REVIEW AND ANNOTATE SHOP DRAWINGS BEFORE SUBMITTING THEM TO THE ARCHITECT/ENGINEER FOR REVIEW. THE CONTRACTOR SHALL ALLOW ARCHITECT/ENGINEER 10 WORKING DAYS FOR REVIEW OF SHOP DRAWINGS.
18. THE STRUCTURAL ENGINEER SHALL BE NOTIFIED FOR A FRAMING OBSERVATION IMMEDIATELY AFTER ROOF PANELS ARE INSTALLED AND BEFORE INSTALLATION OF THE CEILING.

FASTENERS

1. CAST-IN-PLACE AND POST-INSTALLED ANCHORS SHALL BE PER ANCHOR DIAMETER AND EMBEDMENT DEPTH NOTED ON THE DRAWINGS. POST-INSTALLED ANCHORS SHALL BE UTILIZED ONLY WHERE SPECIFIED. ALL ANCHORS SHALL BE HOT-DIPPED GALVANIZED PER ASTM A153.
2. ALL ANCHORS NOTED BELOW SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR SHALL CONTACT MANUFACTURER'S REPRESENTATIVE FOR THE INITIAL TRAINING AND INSTALLATION OF ANCHORS, AND FOR PRODUCT RELATED QUESTIONS AND AVAILABILITY.
3. SPECIAL INSPECTIONS SHALL BE PROVIDED FOR ALL MECHANICAL AND ADHESIVE ANCHORS PER THE APPLICABLE EVALUATION REPORT NOTED BELOW. SPECIAL INSPECTIONS SHALL BE PERFORMED BY INDEPENDENT TESTING LABORATORY PERFORMING QA/QC SERVICES ON PROJECT.
4. EXPANSION BOLTS (EB) IN CONCRETE/CMU SHALL BE TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193. ACCEPTABLE PRODUCTS:

   A. KWIK BOLT III (ICC-ES ESR-2302) BY HILTI (CONCRETE)

   B. KWIK BOLT III (ICC-ES-ESR-1385) BY HILTI (MASONRY)

   C. STRONG-BOLT 2 (ICC-ES ESR-3037) BY SIMPSON STRONG-TIE (CONCRETE)

   D. WEDGE-ALL ANCHOR (ICC-ES ESR-1396) BY SIMPSON STRONG-TIE (MASONRY)

5. HEAVY DUTY SLEEVE ANCHORS IN CONCRETE/CMU SHALL BE TESTED AND QUALIFIED OR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193. EXPANSION BOLTS (EB) SHALL NOT BE SUBSTITUTED FOR SLEEVE ANCHORS WITHOUT PRIOR WRITTEN APPROVAL BY STRUCTURAL ENGINEER. ACCEPTABLE PRODUCTS:

   A. HSL-3 (ICC-ES ESR-1545) BY HILTI (CONCRETE)

6. SCREW ANCHORS IN CONCRETE SHALL BE TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193. ACCEPTABLE PRODUCTS:

   A. KWIK HUS-EZ (ICC-ES ESR-3027) BY HILTI (CONCRETE)

   B. KWIK HUS-EZ (ICC-ES ESR-3056) BY HILTI (MASONRY)

   C. TITEN HD (ICC-ES ESR-2713) BY SIMPSON STRONG-TIE (CONCRETE)

   D. TAPCON ANCHORS (ICC-ES ESR-1671) (MASONRY)

   E. POWERS WEDGE BOLT (ICC-ES ESR-1678) (MASONRY)

7. UNDERCUT ANCHORS IN CONCRETE SHALL BE TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193. ACCEPTABLE PRODUCTS:

   A. HDA (ICC-ES ESR-1546) BY HILTI (CONCRETE)

   B. TORQ-CUT (ICC-ES ESR-2705) BY SIMPSON STRONG-TIE (CONCRETE)

8. POWDER ACTUATED FASTENERS IN CONCRETE/CMU SHALL BE TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193. ACCEPTABLE PRODUCTS:

   A. X-U (ICC-ES ESR-2269) BY HILTI (CONCRETE/MASONRY/STEEL)

   B. POWDER ACTUATED FASTENERS (ICC-ES ESR-2138) BY SIMPSON STRONG TIE CONCRETE/MASONRY)

9. ADHESIVE ANCHORS IN CONCRETE/CMU SHALL BE TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.4 AND ICC-ES AC308. ACCEPTABLE PRODUCTS:

   A. HIT-RE 500-V3 (ICC-ES ESR-3814) BY HILTI (CONCRETE)

   B. HIT-HY 270 (ICC-ES ESR-4143) BY HILTI (MASONRY)

   C. SET-3G (ICC-ES ESR-4057) BY SIMPSON STRONG-TIE (CONCRETE)

   D. SET-3G (ICC-ES ESR-4844) BY SIMPSON STRONG-TIE (MASONRY)

10. J-BOLTS SHALL BE FABRICATED FROM ASTM A36/A307 ROD. BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED. EXPANSION BOLTS/SLEEVE ANCHORS SHALL NOT BE SUBSTITUTED FOR J-BOLTS WITHOUT PRIOR WRITTEN APPROVAL BY STRUCTURAL ENGINEER.
11. HEADED ANCHOR RODS SHALL BE FABRICATED FROM ASTM F1554 MATERIAL, FY=36 KSI.
12. SUBSTITUTION REQUESTS FOR PRODUCTS LISTED ABOVE SHALL BE SUBMITTED BY THE CONTRACTOR TO THE STRUCTURAL ENGINEER ALONG WITH CALCULATIONS THAT ARE PREPARED & SEALED BY A REGISTERED PROFESSIONAL ENGINEER. THE CALCULATIONS SHALL DEMONSTRATE THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF ACHIEVING THE PERTINENT EQUIVALENT PERFORMANCE VALUES OF THE SPECIFIED PRODUCT USING THE APPROPRIATE DESIGN PROCEDURE AND/OR STANDARDS. SUBSTITUTED ANCHORS SHALL HAVE A VALID CURRENT EVALUATION (ICC-ES OR IAPMO-ES) REPORT.
13. REFERENCE STRUCTURAL STEEL NOTES FOR BOLTS CONNECTING STRUCTURAL STEEL COMPONENTS.

EXTERIOR COMPONENTS & CLADDINGS

ALL EXTERIOR COMPONENT AND CLADDING SYSTEMS (E.G. WINDOWS, CURTAIN WALLS, STOREFRONTS, DOORS, ARCHITECTURAL SIDINGS, METAL WALL AND ROOF PANELS, ROOFING SYSTEMS, SKYLIGHTS) MUST MEET MINIMUM WIND CODE REQUIREMENTS. CONTRACTOR MUST SUBMIT COMPONENT AND CLADDING ASSEMBLY WIND PRESSURE AND IMPACT RESISTANCE TESTING RATINGS AND REQUIRED ATTACHMENT PROCEDURES TO STRUCTURAL ENGINEER FOR REVIEW. ROOF TOP MECHANICAL EQUIPMENT AND THEIR SUPPORT COMPONENTS, AND ANCHORING OF THESE ITEMS TO THE STRUCTURE, SHALL BE DELEGATED DESIGN TO BE PERFORMED BY THE EQUIPMENT'S MANUFACTURER, TO MEET THE WIND PRESSURES CALCULATED PER ASCE 7-22 SECTION 29.4.1, USING THE WIND DESIGN PARAMETERS LISTED ON THE GENERAL STRUCTURAL NOTES DESIGN CRITERIA.

1. TESTED ASSEMBLIES
   A. THE CONTRACTOR SHALL INSTALL PROJECT SPECIFIC ASSEMBLIES THAT HAVE BEEN TESTED AND MEET THE APPLICABLE PERFORMANCE REQUIREMENTS LISTED BELOW. PROJECT ASSEMBLIES SHALL BE INSTALLED IN SAME MANNER AS TESTED ASSEMBLIES INCLUDING SYSTEM COMPONENTS, REINFORCEMENT, GLAZING, HARDWARE, ANCHORS AND FASTENING LOCATIONS, SEALANTS & ALL ACCESSORIES, AS APPLICABLE.

2. ASSEMBLY PERFORMANCE REQUIREMENTS
   A. STRUCTURAL PERFORMANCE: TESTED ASSEMBLY THAT PASSES STRUCTURAL PERFORMANCE REQUIREMENTS WHEN TESTED IN ACCORDANCE WITH THE APPLICABLE PERFORMANCE STANDARD(S) LISTED BELOW, AT A MINIMUM OF THE POSITIVE AND NEGATIVE DESIGN WIND-LOAD PRESSURES INDICATED ON THE STRUCTURAL DRAWINGS. TESTED ASSEMBLY SHALL BE NO SMALLER IN WIDTH AND LENGTH THAN ASSEMBLY INDICATED FOR USE ON THE PROJECT AND SHALL MATCH PROJECT ASSEMBLY INCLUDING ALL COMPONENTS AND SUBSTRATE(S).

   B. WINDBORNE-DEBRIS-IMPACT RESISTANCE: TESTED ASSEMBLY THAT PASSES LARGE-MISSILE IMPACT PROTECTION TESTING REQUIREMENTS ACCORDING TO ASTM E 1996 WHEN TESTED ACCORDING TO ASTM E 1886. TESTED ASSEMBLY SHALL BE NO SMALLER IN WIDTH AND LENGTH THAN ASSEMBLY INDICATED FOR USE ON THE PROJECT AND SHALL MATCH PROJECT ASSEMBLY INCLUDING ALL COMPONENTS AND SUBSTRATE(S).

3. ASSEMBLY PERFORMANCE STANDARDS
   A. ASTM E 330 - STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF EXTERIOR WINDOWS, DOORS, SKYLIGHTS AND CURTAIN WALLS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

   B. ASTM E 1592 - STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF SHEET METAL ROOF AND SIDING SYSTEMS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

   C. ASTM E 1886 - STANDARD TEST METHOD FOR PERFORMANCE OF EXTERIOR WINDOWS, CURTAIN WALLS, DOORS, AND STORM SHUTTERS IMPACTED BY MISSILE(S) AND EXPOSED TO CYCLIC PRESSURE DIFFERENTIALS

   D. ASTM E 1996 - STANDARD SPECIFICATION FOR PERFORMANCE OF EXTERIOR WINDOWS, CURTAIN WALLS, DOORS AND IMPACT PROTECTIVE SYSTEMS IMPACTED BY WINDBORNE DEBRIS IN HURRICANES

   E. FM 4450 - APPROVAL STANDARD FOR CLASS 1 INSULATED STEEL DECK ROOFS

   F. FM 4470 - APPROVAL STANDARD FOR SINGLE-PLY, POLYMER-MODIFIED BITUMEN SHEET, BUILT-UP ROOF (BUR) AND LIQUID APPLIED ROOF ASSEMBLIES FOR USE IN CLASS 1 AND NONCOMBUSTIBLE ROOF DECK CONSTRUCTION

   G. FM 4474 - AMERICAN NATIONAL STANDARD FOR EVALUATING THE SIMULATED WIND UPLIFT RESISTANCE OF ROOF ASSEMBLIES USING STATIC POSITIVE AND/OR NEGATIVE DIFFERENTIAL PRESSURES

   H. UL 580 - STANDARD FOR TESTS FOR UPLIFT RESISTANCE OF ROOF ASSEMBLIES

   I. UL 1897 - STANDARD FOR UPLIFT TESTS FOR ROOF COVERING SYSTEMS

EXTERIOR COMPONENTS & CLADDINGS CONTINUED:

4. ASSEMBLY SUBMITTALS
   A. SUBMITTALS SHALL CONSIST OF PROJECT SPECIFIC SHOP DRAWINGS AND ASSEMBLY TEST REPORTS, AS DESCRIBED BELOW. SUBMITTALS SHALL BE COMPLETE, CLEAR AND LEGIBLE; INCOMPLETE SUBMITTALS WILL BE REJECTED.

   B. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING ITEMS:

   1) SYSTEM DESCRIPTION INCLUDING MANUFACTURER'S NAME AND SPECIFIC PRODUCT MODEL NUMBER, NAME OR DESIGNATION.
   2) MANUFACTURER'S PRODUCT DATA/TECHNICAL INFORMATION AND DETAILS.
   3) SYSTEM LAYOUT PLANS, ELEVATIONS, CROSS-SECTIONS AND DETAILS AS APPLICABLE TO THE PROJECT.
   4) DESCRIPTION OF SYSTEM'S ASSEMBLY COMPONENTS (E.G. ROOF LAYERS, FRAME MEMBERS, REINFORCEMENT, DOOR TYPE, GLAZING, HARDWARE, ANCHORS AND FASTENING LOCATIONS, SEALANTS, ACCESSORIES). ALL COMPONENTS SHALL MATCH THOSE SPECIFIED ON ASSEMBLY TEST REPORTS.
   5) SHOP DRAWINGS SHALL INDICATE THE SYSTEM ATTACHMENT METHOD INCLUDING ANCHOR TYPE AND FASTENER LOCATIONS FOR EACH DIFFERENT TYPE OF SUBSTRATE. SYSTEM ATTACHMENT SHALL BE PER ASSEMBLY TEST REPORTS.
   6) ASSEMBLY TEST REPORTS OFTEN PROVIDE OPTIONS FOR MATERIALS AND FASTENING METHODS. SHOP DRAWINGS SHALL BE SPECIFIC TO THE MATERIAL OR METHOD THAT THE CONTRACTOR IS PROPOSING TO INSTALL ON THE PROJECT.
   7) CROSS-REFERENCING BETWEEN THE SHOP DRAWINGS AND THE ASSEMBLY TEST REPORTS IS ENCOURAGED, BUT THE SHOP DRAWINGS SHALL BE DETAILED ENOUGH TO STAND INDEPENDENT OF THE TEST REPORTS.

   C. ASSEMBLY TEST REPORTS SHALL INCLUDE THE FOLLOWING ITEMS:

   1) PERFORMANCE RATINGS BASED ON EVALUATION OF COMPREHENSIVE TESTING IN ACCORDANCE WITH THE APPLICABLE PERFORMANCE STANDARD(S) LISTED ABOVE.
   2) TESTING AND DEVELOPMENT OF REPORTS SHALL BE PERFORMED BY A QUALIFIED THIRD-PARTY TESTING AGENCY.
   3) TEST REPORTS SHALL BE SEALED BY THE QUALIFIED PROFESSIONAL ENGINEER RESPONSIBLE FOR THEIR PREPARATION.
   4) TEST REPORTS SHALL BE RECENT TO INCLUDE THE MOST CURRENT SYSTEM MANUFACTURER'S COMPONENTS AND AVAILABLE FASTENERS AND ACCESSORIES. EXPIRED TEST REPORTS SHALL BE REJECTED.
   5) TEST REPORTS SHALL BE SUBMITTED FOR EACH DIFFERENT TYPE OF ASSEMBLY ON THE PROJECT INCLUDING VARIATIONS OF SYSTEM COMPONENTS AND SUBSTRATES.

SPECIAL INSPECTIONS

SPECIAL INSPECTIONS INDEPENDENT OF THE CONTRACTOR, THE ARCHITECT, OR THE ENGINEER, SHALL BE PROVIDED BY A SPECIAL INSPECTOR EMPLOYED BY THE OWNER ACCORDING TO CHAPTER 17 OF THE IBC 2024. THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS. THE SPECIAL INSPECTOR SHALL SEND WRITTEN REPORTS TO THE OWNER, THE ARCHITECT, THE ENGINEER AND THE CONTRACTOR. THE REPORTS SHALL INDICATE IF WORK INSPECTED WAS DONE IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THE DISCREPANCIES ARE NOT CORRECTED, THE SPECIAL INSPECTOR SHALL BRING THE DISCREPANCIES TO THE ATTENTION OF THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT STATING THAT THE SPECIAL INSPECTION WORK WAS, TO THE BEST OF THEIR KNOWLEDGE, IN OR NOT IN CONFORMANCE WITH THE DRAWINGS, SPECIFICATIONS AND APPLICABLE WORKMANSHIP PROVISIONS OF THE IBC 2024.

CONTINUOUS OR PERIODIC SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING WORK:

REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC
INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING TENDONS, AND PLACEMENT		X
INSPECT BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE	X	
VERIFY USE OF REQUIRED DESIGN MIX		X
PERFORM SLUMP AND AIR CONTENT TEST, AND DETERMINE THE TEMPERATURE OF THE CONCRETE AT THE TIME OF SAMPLING FRESH CONCRETE FOR MAKING SPECIMENS FOR STRENGTH TESTS PER ACI 318	X	
INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	X	
INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES		X
INSPECTION OF PRESTRESSED CONCRETE APPLICATION OF PRESTRESSING FORCES	X	
VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS		X
ERECTION OF PRECAST CONCRETE MEMBERS		X
INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED		X

REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC
MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS		X
INSPECTION OF HIGH STRENGTH BOLTING		X
INSPECTION OF WELDING:		
COMPLETE AND PARTIAL PENETRATION GROOVE WELDS	X	
MULTIPASS FILLET WELDS	X	
SINGLE-PASS FILLET WELDS		X
FLOOR AND ROOF DECK WELDS		X
INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS		X

REQUIRED VERIFICATION AND INSPECTION OF ANCHORS

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC
CAST-IN-PLACE, POST-INSTALLED, MECHANICAL AND EPOXY SET ANCHORS: AS APPLICABLE, THE INSPECTION PROGRAM SHALL VERIFY THE ANCHOR TYPE, EMBEDMENT, TIGHTENING TORQUE, DIMENSIONS, HOLE DEPTH & DIAMETER AND CLEANOUT, EPOXY MIXING AND PLACEMENT PROCEDURES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND THE CURRENT ICC-ES EVALUATION REPORT	FREQUENCY OF INSPECTION SHALL BE IN ACCORDANCE WITH THE CURRENT ICC-ES EVALUATION REPORT, OR PER THE SPECIAL INSPECTION REQUIREMENTS OF THE ANCHOR SUBSTRATE, WHICHEVER IS MORE STRINGENT	

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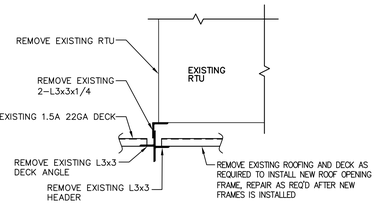
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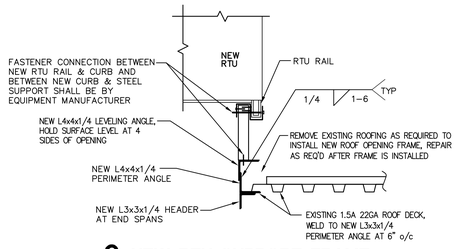
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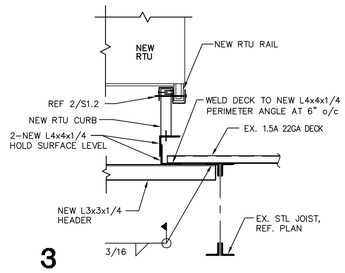
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Drawn By: V.M.
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Sheet: S1.1



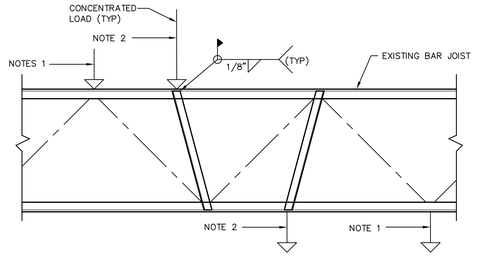
1 TYPICAL EXISTING RTU FRAME DEMOLITION DETAIL



2 NEW RTU SUPPORT FRAME



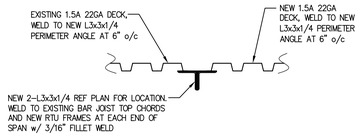
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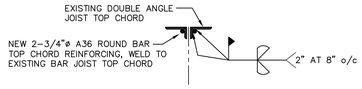
4 TYP. CONCENTRATED LOAD DETAIL

NOTES:

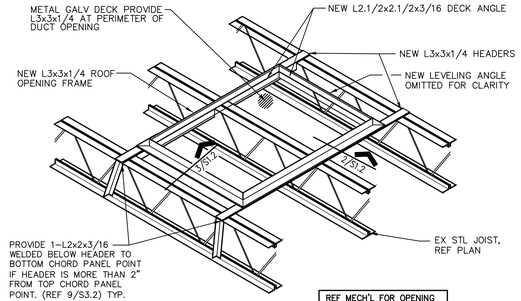
1. CONCENTRATED LOAD LOCATED AT JOIST PANEL POINT LOCATION – NO ADDTIONAL ANGLES REQUIRED.
2. CONCENTRATED LOAD (100 LBS. OR HEAVIER) NOT LOCATED AT JOIST PANEL POINT LOCATION – PROVIDE L2x2x1/4 TO PANEL POINT AS SHOWN.



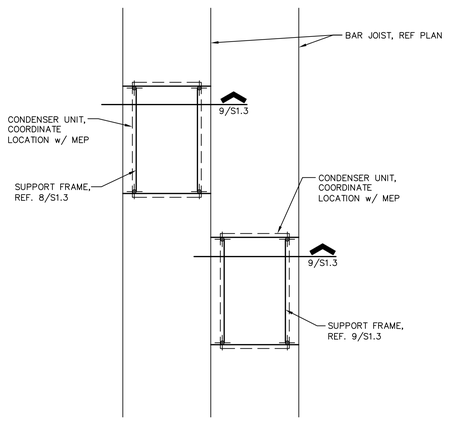
5 EXISTING TO NEW DECK TRANSITION DETAIL



6 TYPICAL TOP CHORD REINFORCEMENT



7 ROOF OPENING FRAME DETAIL

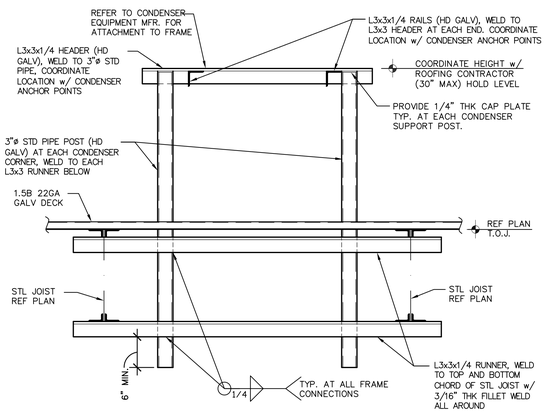


8 TYPICAL ROOF MOUNTED CONDENSER SUPPORT FRAMING PLAN

1/4" = 1'-0"

NOTES:

1. COORDINATE LOCATION AND ORIENTATION WITH MEP AND ARCHITECTURAL.



9

NOTE:

1. COORDINATE LOCATION OF SUPPORT FRAME WITH MEP & EQUIPMENT MANUFACTURER.

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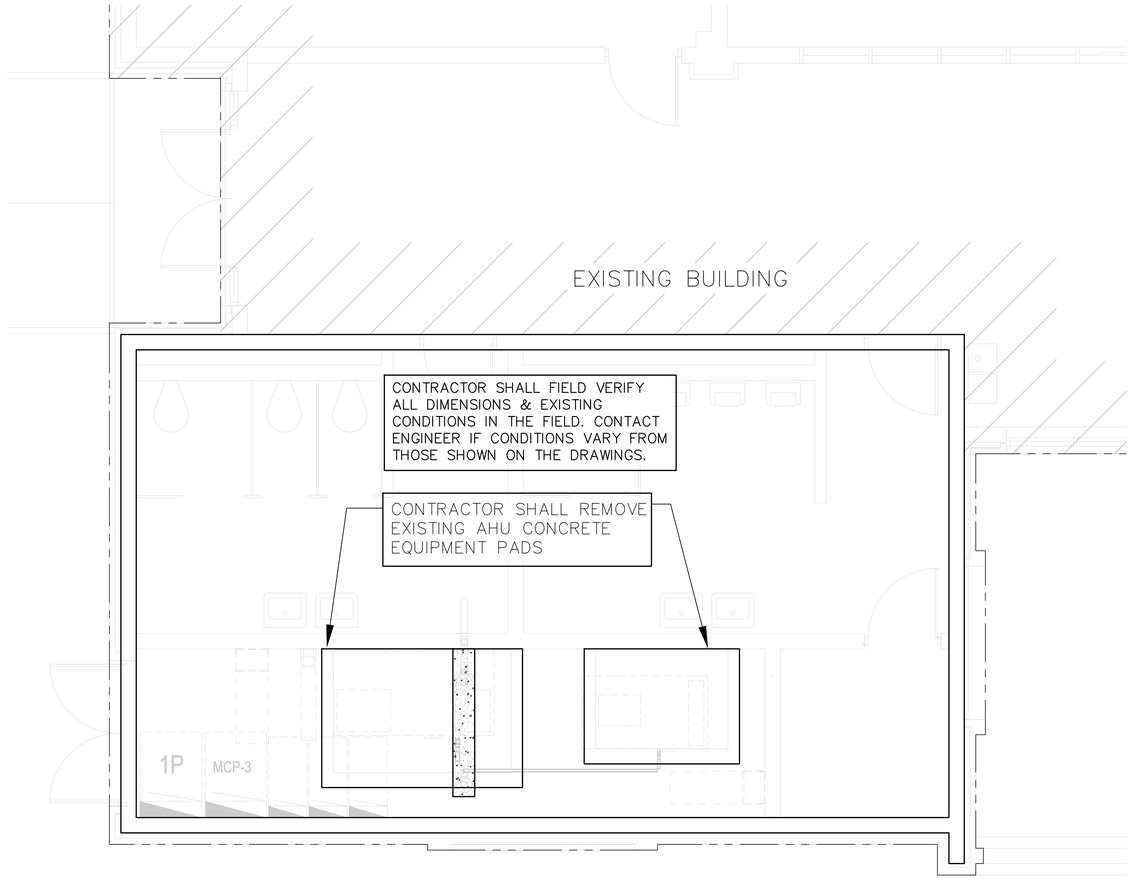
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Drawn By:	V.M.
Job No.	192-632
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1 STISD WORLD SCHOLARS LIBRARY FOUNDATION DEMOLITION PLAN

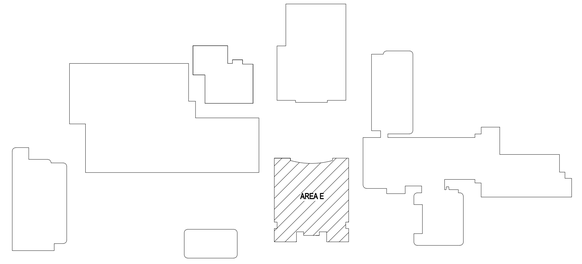
3/8" = 1'-0" LIBRARY / AREA E

N

PLAN NORTH

NOTES:

1. [dotted] INDICATES APPROXIMATE LOCATION OF EXISTING 5" THICK FLOOR SLAB TO BE SAWCUT AND DEMOLISHED TO INSTALL NEW UNDERGROUND PLUMBING AND ELECTRICAL, VERIFY WITH MEP. ONCE PLUMBING IS INSTALLED TRENCH SHALL BE BACKFILLED WITH FLOWABLE FILL AND A NEW 5" THK SLAB SHALL BE POURED FLUSH WITH FINISH FLOOR.
2. CONTRACTOR SHALL COORDINATE LIMITS OF EXISTING SLAB. DEMOLITION WITH M.E.P.
3. COORDINATE ADDITIONAL DEMOLITION SCOPE WITH ARCHITECTURAL AND MEP.



EDINBURG KEYPLAN

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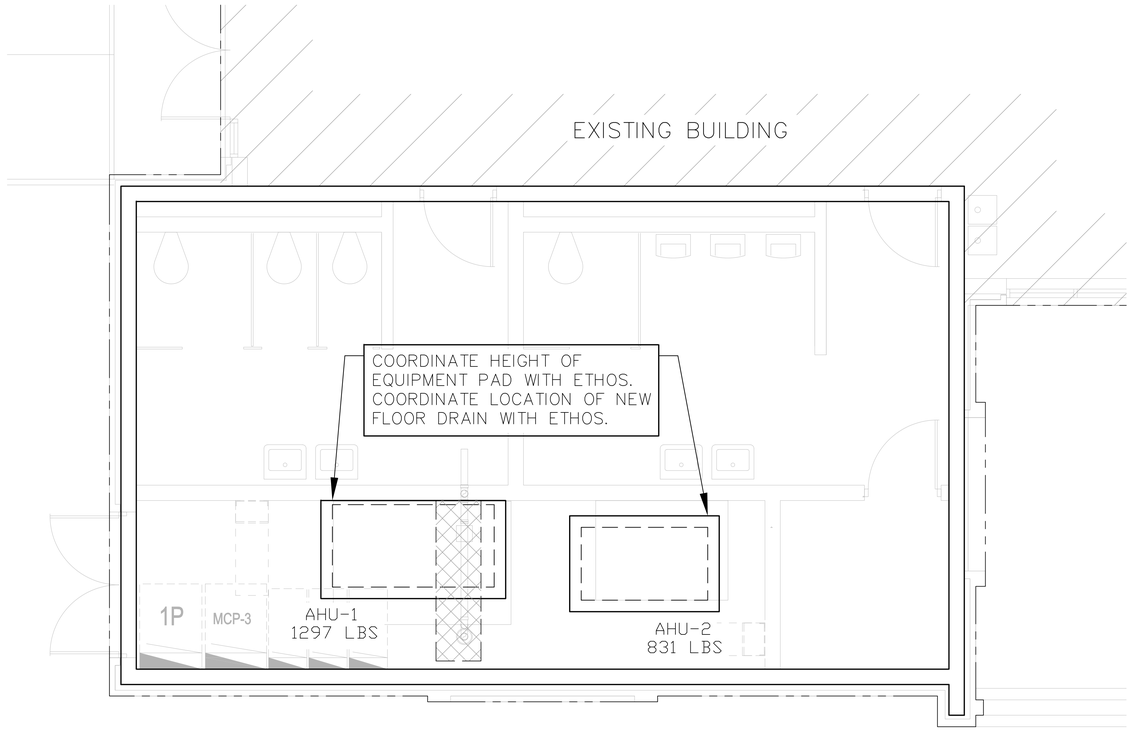
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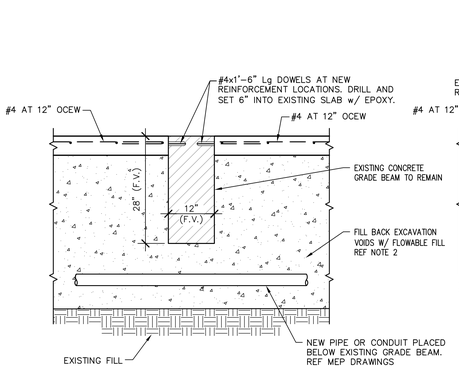
1 STISD WORLD SHOLARS LIBRARY FOUNDATION RENOVATION PLAN

3/8" = 1'-0" LIBRARY / AREA E

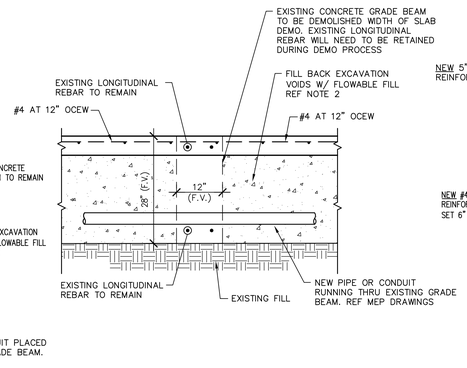
N
PLAN NORTH

NOTES:

1. CONTRACTOR SHALL COORDINATE LIMITS OF EXISTING SLAB. DEMOLITION WITH M.E.P.
2. COORDINATE ADDITIONAL DEMOLITION SCOPE WITH ARCHITECTURAL AND MEP.



OPTION 1 IF NEW PLUMBING LINES RUN BELOW EXISTING GRADE BEAM

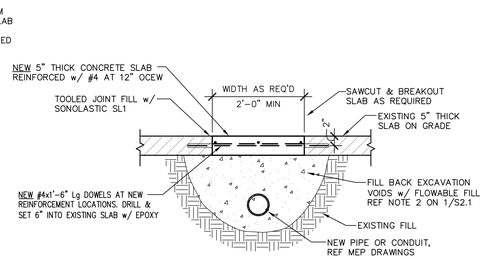


OPTION 2 IF NEW PLUMBING LINES RUN THRU EXISTING GRADE BEAM

2

NOTES:

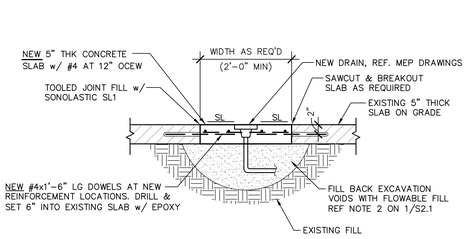
1. CONTRACTOR TO COORDINATE LOCATIONS OF INTERIOR GRADE BEAMS IN THE FIELD.
2. THE CONTRACTOR SHALL PROVIDE FLOWABLE FILL ACCORDING TO TxDOT STANDARD SPECIFICATION ITEM 401 FLOWABLE BACKFILL. THE FLOWABLE FILL SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 80-200 PSI, AIR CONTENT PERCENTAGE OF 5%-10% AND FINE AGGREGATE MEETING THE REQUIREMENTS OF ITEM 401, TABLE 1. THE CONTRACTOR SHALL SUBMIT A FLOWABLE FILL MIX DESIGN FROM A READY MIX SUPPLIER.



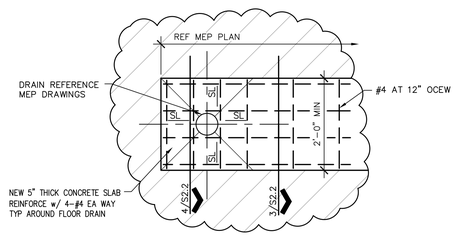
3 TYPICAL UTILITY TRENCH DETAIL

NOTES:

1. COORDINATE UTILITY TRENCH LOCATION WITH MEP DRAWINGS.



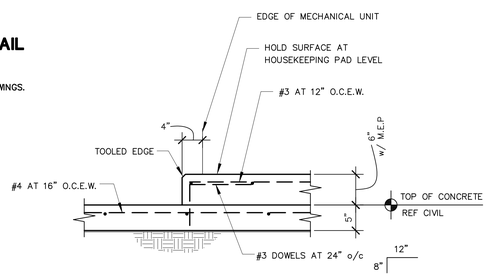
4



5 TYPICAL DRAIN DETAIL

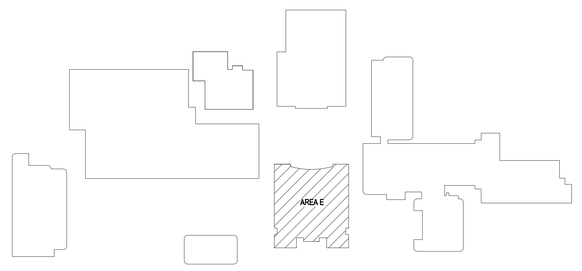
NOTES:

1. COORDINATE LOCATION AND ORIENTATION w/ MEP DRAWINGS.



6 TYPICAL HOUSEKEEPING PAD DETAIL

NOTE: COORDINATE SIZE, LOCATION & QUANTITIES OF HOUSEKEEPING PADS WITH MEP & ARCHITECTURAL



EDINBURG KEYPLAN

TYPICAL FOUNDATION/SLAB REPAIR DETAILS

GENERAL STRUCTURAL NOTES

HAZARDOUS MATERIALS ABATEMENT/ MANAGEMENT

1. THE ENGINEER HAS NO RESPONSIBILITY OR LIABILITY FOR DESIGN, REMOVAL OF, OR TESTING FOR ASBESTOS/LEAD, OR FOR ABATEMENT /MANAGERIAL TREATMENTS, MONITORING, AND LEGAL DISPOSAL OF MATERIALS. CONTRACTOR SHALL DETERMINE IF ANY HAZARDOUS MATERIAL ABATEMENT/ MANAGEMENT IS REQUIRED AND SHALL INCLUDE COSTS THEREOF IN THE BID.

CONSTRUCTION NOTES ON THE REPAIR WORKS ON EXISTING STRUCTURE

1. BEFORE PROCEEDING WITH ANY WORK WITHIN THE EXISTING FACILITY. THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH EXISTING STRUCTURAL AND OTHER CONDITIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL NECESSARY BRACING, SHORING AND OTHER SAFEGUARDS TO MAINTAIN ALL PARTS OF THE EXISTING WORK IN A SAFE CONDITION DURING THE PROCESS OF DEMOLITION AND CONSTRUCTION AND TO PROTECT FROM DAMAGE THOSE PORTIONS OF THE EXISTING WORK WHICH ARE TO REMAIN.
2. THE CONTRACTOR SHALL FIELD VERIFY THE DIMENSIONS, ELEVATIONS, ETC. NECESSARY FOR THE PROPER CONSTRUCTION AND ALIGNMENT OF THE NEW PORTIONS OF THE WORK TO THE EXISTING WORK. THE CONTRACTOR SHALL MAKE ALL MEASUREMENTS NECESSARY FOR FABRICATION AND ERECTION OF STRUCTURAL MEMBERS. ANY DISCREPANCY SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. WELDING TO AND WITHIN AN EXISTING FACILITY PRESENTS POTENTIAL HAZARDS INCLUDING:
   A. FIRE HAZARD – DUE TO THE EXISTING CONSTRUCTION AND BUILDING CONTENTS.
   B. STRUCTURAL LIQUEFACTION – DUE TO WELDING ACROSS THE FULL SECTION OF STRUCTURAL STEEL MEMBERS.

   RECOMMENDATIONS TO PREVENT THESE HAZARDS INCLUDE.
   A. FIRE HAZARD – PROTECT EXISTING COMBUSTIBLES PRIOR TO WELDING. KEEP A SEPARATE WATCHMAN AND SEVERAL FIRE EXTINGUISHERS ON HAND.
   B. STRUCTURAL LIQUEFACTION – WELD IN SMALL INCREMENTS. ALLOW WELDS TO HARDEN BEFORE CONTINUING TO THE NEXT INCREMENT.
   C. DO NOT LEAVE THE SITE UNTIL SATISFIED THAT NO FIRE HAZARD EXISTS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND ERECTION OF ALL SHORING NECESSARY TO SAFEGUARD THE EXISTING STRUCTURE.

EXISTING CONDITIONS

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS. DIMENSIONS SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR SHALL OBTAIN ALL FIELD MEASUREMENTS AS NECESSARY TO COORDINATE NEW CONSTRUCTION TO EXISTING CONDITIONS.
2. IF EXISTING CONDITIONS DIFFER FROM THE DRAWINGS, INFORM THE ENGINEER AND ADDITIONAL DETAILS OR INTERPRETATION WILL BE PROVIDED. DO NOT PROCEED WITHOUT VERIFICATION.
3. THE CONTRACTOR SHALL VISIT THE SITE OF THE PROPOSED WORK AND FULLY ACQUAINT THEMSELVES WITH THE EXISTING CONDITIONS.

DEMOLITION NOTES

1. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE EXISTING STRUCTURE AND SURROUNDING BUILDINGS DURING CONSTRUCTION.
2. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY WATERTIGHTNESS OF THE BUILDING DURING DEMOLITION AND RECONSTRUCTION.
3. GENERAL CONTRACTOR SHALL COORDINATE WITH ENGINEER ITEMS THAT ARE UNCLEAR PRIOR TO ANY DEMOLITION.
4. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE PROJECT SITE TO DETERMINE DEMOLITION REQUIREMENTS AT THIS PROJECT. CONTRACTOR SHALL INCLUDE IN THEIR BID ALL THE DEMOLITION REQUIREMENTS TO COMPLETE THIS PROJECT.
5. GENERAL CONTRACTOR SHALL LOCATE AND LABEL ALL UTILITIES BEFORE COMMENCEMENT OF DEMOLITION & CONSTRUCTION ACTIVITIES. UTILITIES SHALL BE CLEARLY MARKED SO THAT ANY SUBCONTRACTOR VISITING THIS SITE CAN EASILY IDENTIFY UTILITIES. ANY COSTS TO REPAIR DAMAGES IF UTILITIES ARE NOT PROPERLY IDENTIFIED, ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
6. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING DEBRIS & MATERIAL AWAY FROM SITE ACCORDING TO GOVERNING LOCAL, STATE OR FEDERAL REGULATIONS.
7. ANY AREA DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.

SAFETY

1. PERFORM ALL WORK IN A SAFE AND CONSCIENTIOUS MANNER TO PREVENT INJURIES.
2. CONTRACTOR SHALL MAINTAIN OSHA STANDARDS FOR JOB SAFETY AND WORKER PROTECTION, INCLUDING, BUT NOT LIMITED TO ADEQUATE PROTECTION, BARRICADES, SIGNS, ETC.
3. THE GENERAL CONTRACTOR IS SOLELY RESPONSIBLE FOR SAFETY. THE ENGINEER EXPRESSLY EXCLUDES ANY RESPONSIBILITY FOR CONTRACTOR SAFETY OR SAFETY OF JOBSITE.

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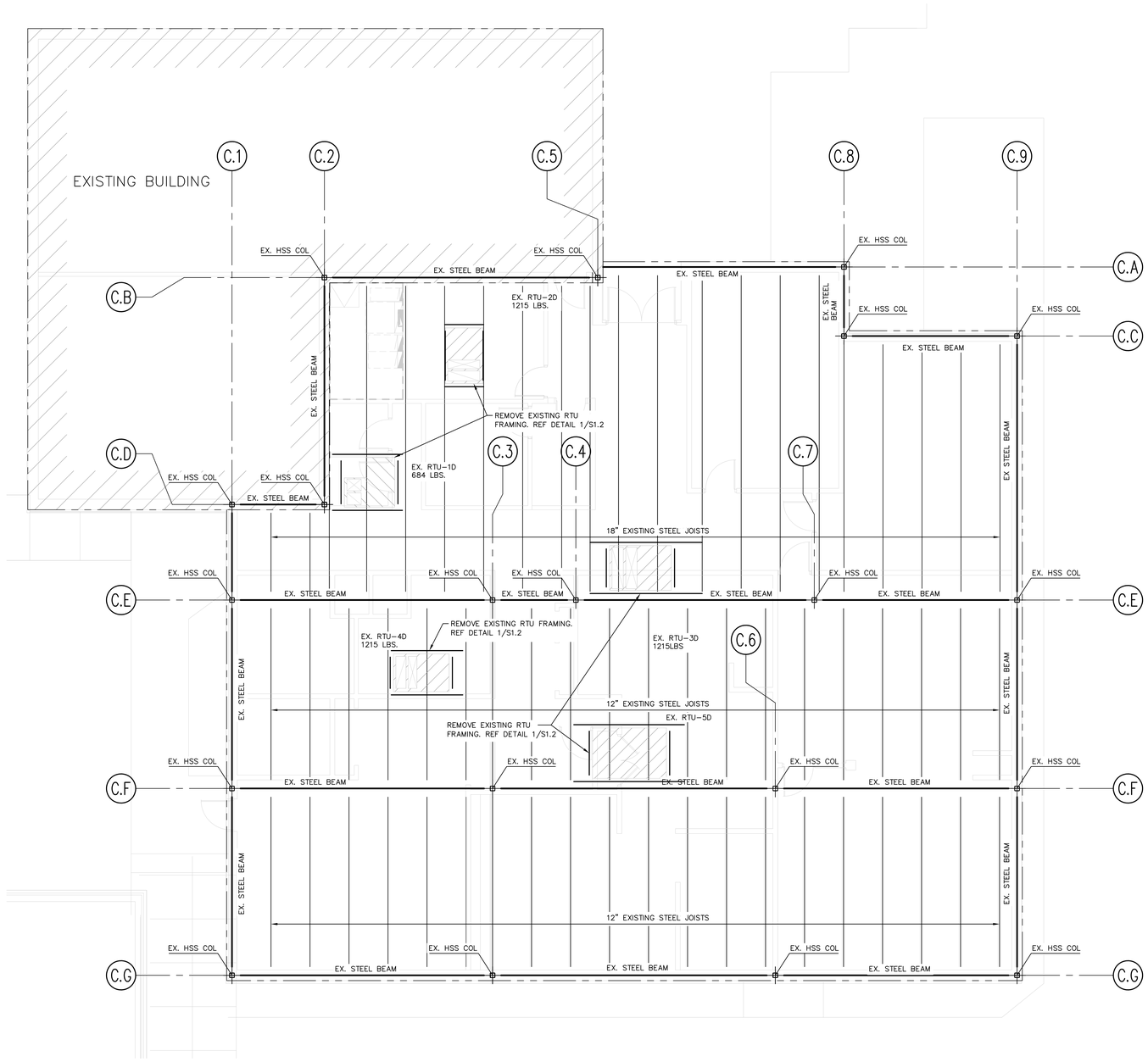
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Drawn By:	V.M.
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1 STISD WORLD SCHOLARS ALBERT H. STRUCTURAL DEMOLITION FRAMING PLAN

3/16" = 1'-0" ALBERT H. / AREA C

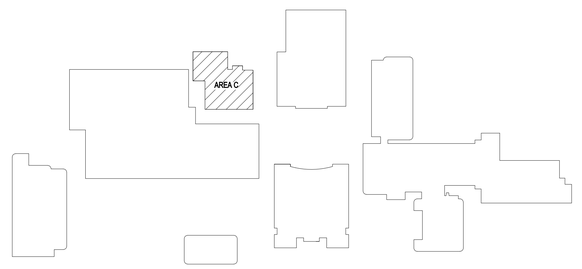
N

PLAN NORTH

NOTES:

1. SCOPE OF DEMOLITION WORK:
   - A. EXISTING RTU LOCATION. REMOVE EXISTING RTU ON ROOF.
   - B. ▨ REMOVE EX CEILING GRID TO EXPOSE RTU FRAME.
   - C. PRIOR TO REMOVING EXISTING RTU FRAMING, COORDINATE ORIENTATION AND LIMITS OF NEW RTU UNIT. SALVAGE EXISTING RTU HEADER AND DECK FRAMING AT THE AREAS OF EXISTING TO NEW ROOF DECK TRANSITIONS. REFERENCE DETAIL 5/S1.2 FOR EXISTING TO NEW DECK TRANSITION DETAIL.
2. REFERENCE MEP FOR ADDITIONAL DEMOLITION SCOPE.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



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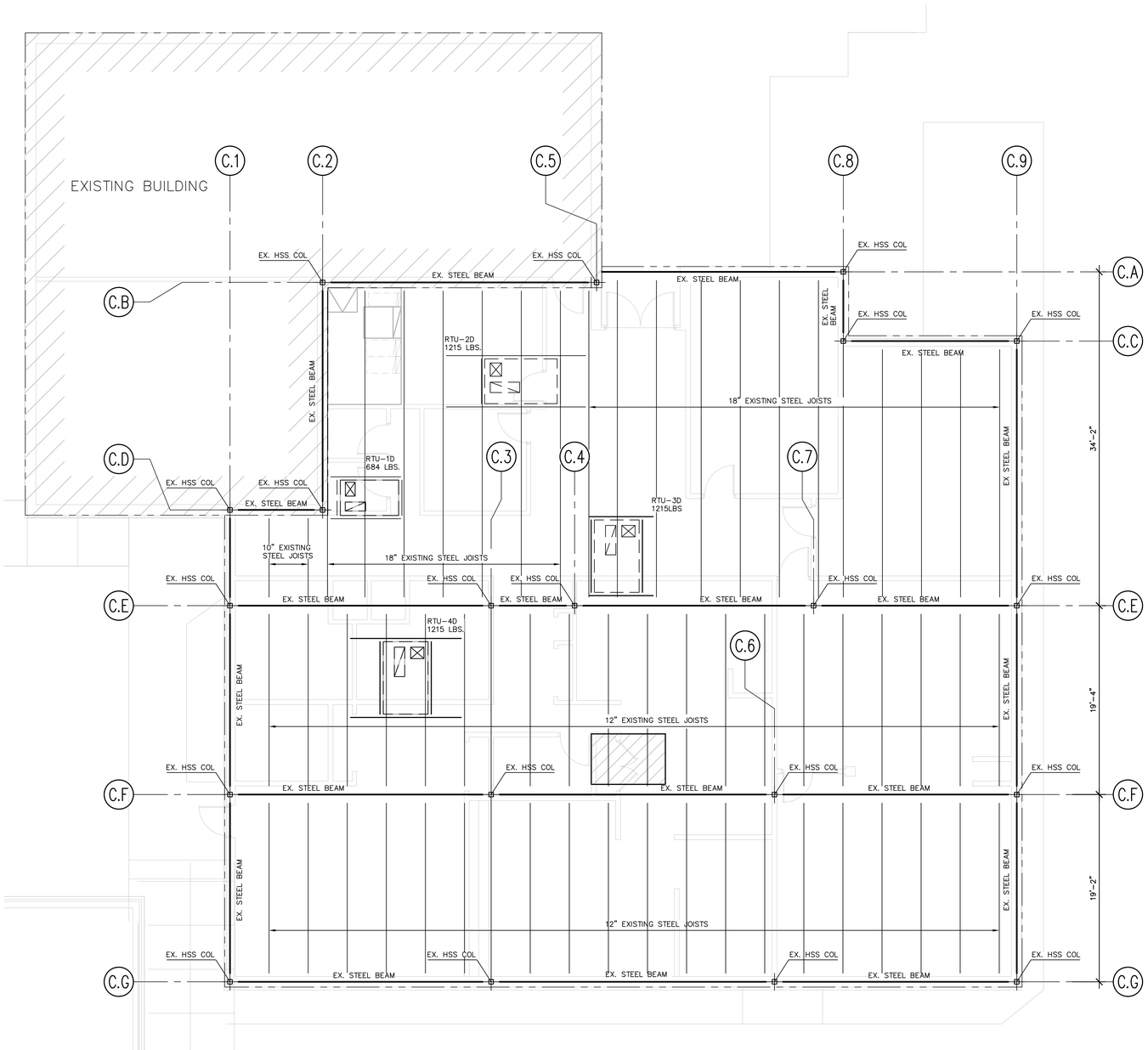
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1 STISD WORLD SCHOLARS ALBERT H. STRUCTURAL RENOVATION FRAMING PLAN

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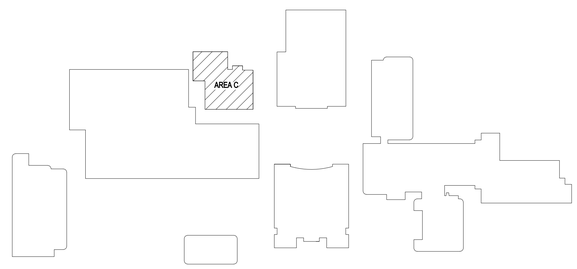
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PLAN NORTH

NOTES:

1. SCOPE OF WORK:
   - A – MODIFY EXISTING ROOF OPENING FRAME AS REQUIRED TO INSTALL NEW FRAME FOR NEW OPENING SIZE.
   - B – INSTALL NEW ROOF OPENING FRAME PER DETAIL 7/S1.2.
   - C – INSTALL NEW METAL ROOF DECK AS REQUIRED TO CLOSE-OFF AREAS BETWEEN NEW AND EXISTING ROOF OPENINGS.
   - D – INSTALL NEW ROOFING INTEGRATED WITH EXISTING ROOF AND ONTO NEW RTU CURBS AS REQUIRED FOR A COMPLETE WATERPROOF INSTALLATION (BY OTHERS).
2. NEW ROOF DECK SHALL BE 1.5A 22GA GALV DECK BY VULCRAFT OR APPROVED EQUAL. (I_p=0.104 IN^4/FT; S_p=0.098 IN^3/FT; I_n=0.120 IN^4/FT; S_n=0.106 IN^3/FT; F_y=33KSI). ATTACH DECK TO SUPPORTS USING 5/8" PUDDLE WELDS ON A 36/7 PATTERN AND 7-#10 TEK SCREW SIDE LAP FASTENERS.
3. PRIOR TO INSTALLATION OF MECHANICAL EQUIPMENT, NOTIFY ENGINEER IF EQUIPMENT WEIGHTS OR LOCATIONS VARY FROM THAT SHOWN ON PLAN TO ALLOW VERIFICATION OF STRUCTURAL CAPACITY OF FRAMING MEMBERS.
4. REFER TO MECHANICAL AND MANUFACTURER'S DRAWINGS FOR FASTENING OF THE ROOF CURB AND HVAC UNITS TO RTU SUPPORT FRAMES.
6. ALL STRUCTURAL STEEL NOTED ON FRAMING PLAN IS EXISTING UNLESS NOTED OTHERWISE.
7. [hatch] INDICATES AREAS WHERE NEW 1.5A 22GA GALV ROOF DECK WILL NEED TO BE INSTALLED AT EXISTING ROOF OPENINGS. REFERENCE DETAIL 5/S1.2 FOR EXISTING TO NEW DECK TRANSITION DETAIL.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



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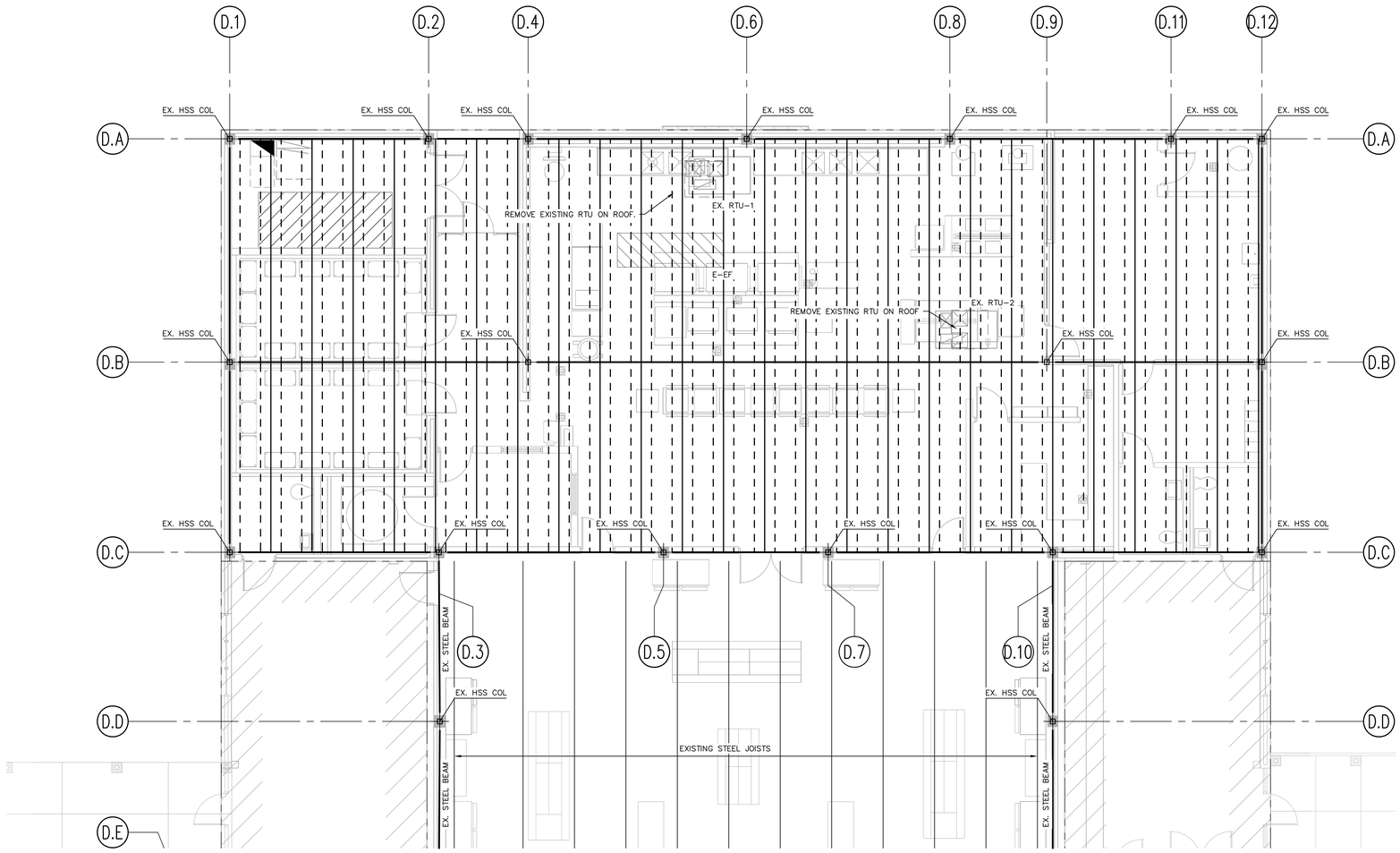
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Drawn By:	V.M.
Job No.	192-632
Sheet:	S3.2



1 STISD WORLD SCHOLARS KITCHEN STRUCTURAL DEMOLITION FRAMING PLAN

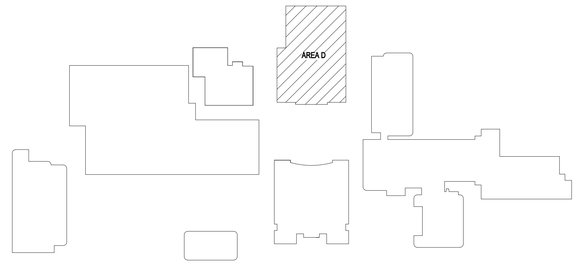
3/16" = 1'-0" KITCHEN / AREA D

N
PLAN NORTH

NOTES:

1. CONTRACTOR SHALL REMOVE A 10 FT BY 10 FT AREA OF CEILING TILE AND SUPPORT FRAMING IMMEDIATELY BELOW EXISTING AND PROPOSED ROOF TOP UNIT LOCATIONS.
2. CONTRACTOR SHALL CONTACT GRA ENGINEERING TO SCHEDULE A STRUCTURAL CONDITION ASSESSMENT OF EXISTING CONDITIONS BENEATH RTUS.
3. CONTRACTOR SHALL PROVIDE ALL NECESSARY LADDERS, PERSONNEL LIFTS, AND VERTICAL ACCESS REQUIRED TO ASSIST GRA ENGINEERING WITH STRUCTURAL CONDITION ASSESSMENT.
4. CONTRACTOR SHALL USE THE SMALLEST APPROPRIATE SIZE DEMOLITION EQUIPMENT AND TOOLS TO AVOID EXCESSIVE VIBRATION IN EXISTING STRUCTURE IN ORDER TO REMOVE SLAB AT NEW OPENING.
5. CONTRACTOR SHALL INCLUDE ALL NECESSARY LABOR, EQUIPMENT, TOOLS, AND SUPERVISION TO DEMOLISH EXISTING SLAB AT NEW OPENING.
6. CONSTRUCTION SHALL COORDINATE LOCATIONS AND DIMENSIONS OF OPENING WITH MEP.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



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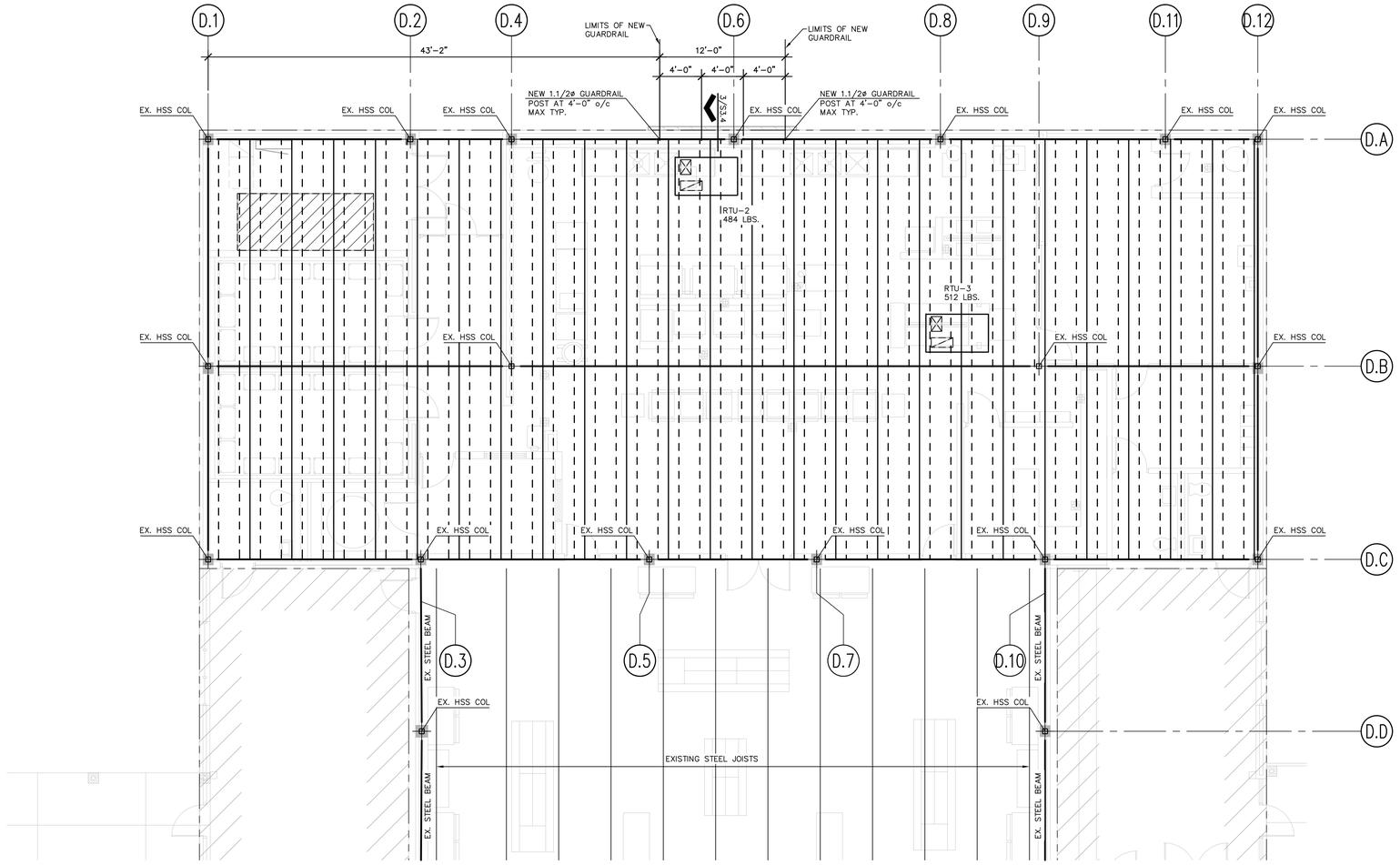
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1 STISD WORLD SCHOLARS KITCHEN STRUCTURAL RENOVATION FRAMING PLAN

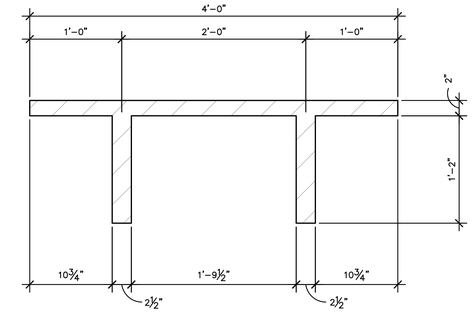
3/16" = 1'-0" KITCHEN / AREA D

N
PLAN NORTH

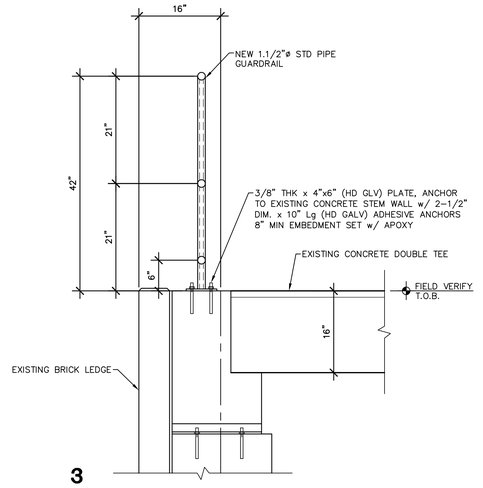
NOTES:

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2. CONTRACTOR SHALL CONTACT GRA ENGINEERING TO SCHEDULE A STRUCTURAL CONDITION ASSESSMENT OF EXISTING CONDITIONS BENEATH RTUS.
3. CONTRACTOR SHALL PROVIDE ALL NECESSARY LADDERS, PERSONNEL LIFTS, AND VERTICAL ACCESS REQUIRED TO ASSIST GRA ENGINEERING WITH STRUCTURAL CONDITION ASSESSMENT.
4. CONTRACTOR SHALL USE THE SMALLEST APPROPRIATE SIZE DEMOLITION EQUIPMENT AND TOOLS TO AVOID EXCESSIVE VIBRATION IN EXISTING STRUCTURE IN ORDER TO REMOVE SLAB AT NEW OPENING.
5. CONTRACTOR SHALL INCLUDE ALL NECESSARY LABOR, EQUIPMENT, TOOLS, AND SUPERVISION TO DEMOLISH EXISTING SLAB AT NEW OPENING.
6. CONSTRUCTION SHALL COORDINATE LOCATIONS AND DIMENSIONS OF OPENING WITH MEP.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.

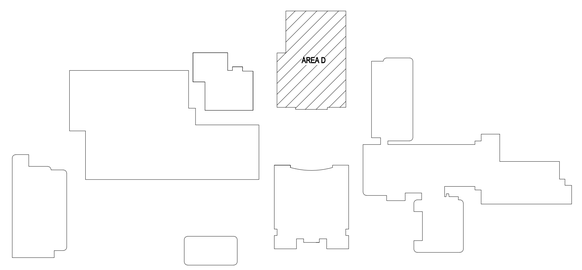


2 TYPICAL PRE-CAST CONCRETE DOUBLE TEE SECTION



3

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



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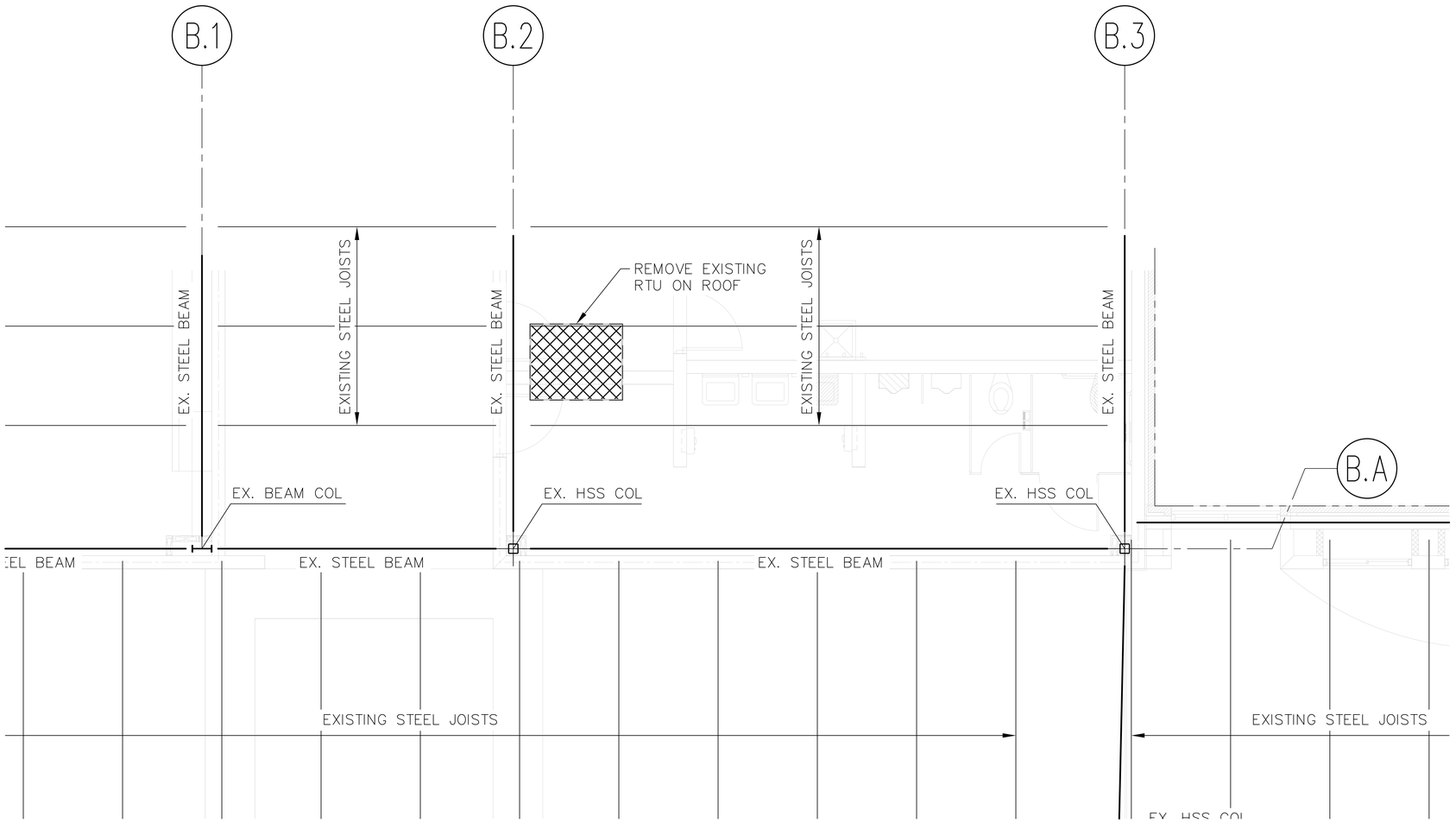
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1 STISD MEDICAL PROFESSIONS STRUCTURAL DEMOLITION FRAMING PLAN

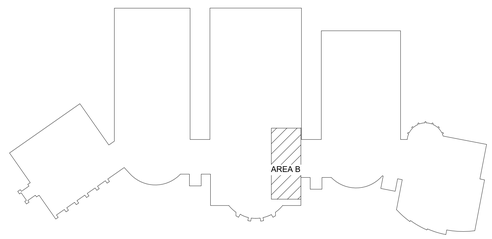
3/16" = 1'-0" MEDICAL / AREA B

N
PLAN NORTH

NOTES:

1. SCOPE OF WORK:
   - A – REMOVE EXISTING EQUIPMENT CURBS AND ASSOCIATED ROOF FLASHING.
   - B – INSTALL NEW HVAC CONDENSER UNIT SUPPORT FRAMING.
   - C – INSTALL NEW ROOFING AND FLASHING NECESSARY TO WATERTIGHT AND WARRANTY ROOF REPAIRS AROUND BASE OF CONDENSER UNITS.
2. PRIOR TO INSTALLATION OF MECHANICAL EQUIPMENT, NOTIFY ENGINEER IF EQUIPMENT WEIGHTS OR LOCATIONS VARY FROM THAT SHOWN ON PLAN TO ALLOW VERIFICATION OF STRUCTURAL CAPACITY OF FRAMING MEMBERS.
3. REFER TO MEP AND EQUIPMENT MANUFACTURER'S DRAWINGS FOR FASTENING OF CONDENSER UNITS TO SUPPORT STEEL FRAMING.
4. ALL STRUCTURAL STEEL NOTED ON FRAMING PLAN IS EXISTING UNLESS NOTED OTHERWISE.
5. ▨ INDICATES ROOF AREA AFFECTED BY SCOPE OF WORK.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



MEDICAL ACAD. KEYPLAN

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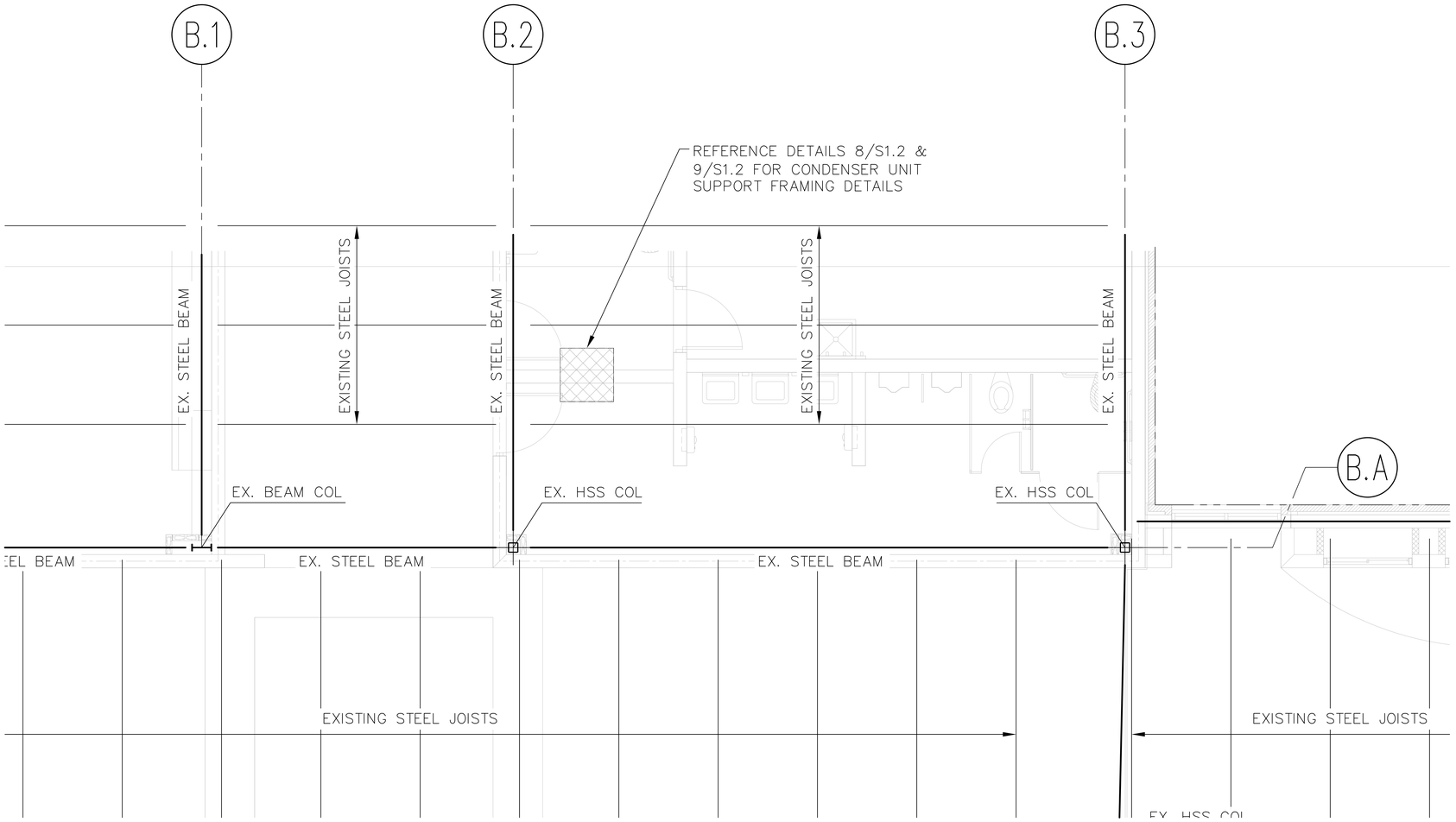
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1 STISD MEDICAL PROFESSIONS STRUCTURAL RENOVATION FRAMING PLAN

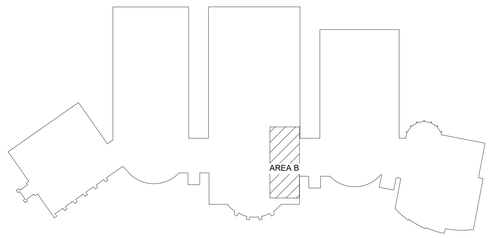
3/8" = 1'-0" MEDICAL / AREA B

N
PLAN NORTH

NOTES:

1. REFERENCE MEP DRAWINGS FOR ROOF-MOUNTED HVAC CONDENSER UNIT LOCATION.
2. REFERENCE DETAILS 8/S1.2 & 9/S1.2 FOR CONDENSER SUPPORT FRAMING DETAILS.
3. CONTRACTOR SHALL COORDINATE ROOFING DETAILS WITH STEEL INSTALLATION.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.



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South Texas Independent School District

Dear Prospective Vendor,

Public schools in Texas are required to follow specific guidelines when procuring goods or services. The most efficient method that we follow is by utilizing membership with purchasing cooperatives. The cooperatives to which the district current belongs are listed below:

- 791 Purchasing Cooperative (ESC Region 15)
- Allied States Purchasing Cooperative (ESC Region 19)
- Child Nutrition Program-South Texas Cooperative (ESC Region 1)
- Choice Partners (Harris County Department of Education)
- Equalis Group
- Goodbuy (Region 2)
- Houston-Galveston Area Council
- OMNIA Partners/U.S.Communities/National IPA/TCPN, National Cooperative Purchasing Alliance (Region 14)
- PACE (ESC Region 20)
- Purchasing Cooperative of America
- Region 1 Education Service Center
- Sourcewell/ NJPA (National Joint Powers Alliance)
- TASB BuyBoard
- Texas DIR (Department of Information Resources)
- TIPS (ESC Region 8)
- TPASS/TXSmartBuy (State of Texas Comptroller)

When a vendor has been awarded a contract from one of the above groups, then we may utilize that vendor for purchasing. If a prospective vendor has not been awarded a contract with one of the above groups, we may not utilize that vendor for purchasing unless awarded a bid through a South Texas ISD competitive bid process. Certain sole source vendors are exempt from these requirements; however, there are very stringent requirements for consideration as a sole source vendor.

We encourage you to contact one or more of the above groups for a list of pending bids. In the event that you have received an award through a different public purchasing group or cooperative, then please advise us in writing of the cooperative name and contract awarded number for our consideration.

Thank you for your interest in doing business with South Texas ISD.

Reynaldo Cantu

Purchasing Agent/ Accountant
reynaldo.cantu@stisd.net

South Texas Independent School District

Vendor Application

Contact Information:
Reynaldo Cantu
Purchasing Agent/Accountant
Phone (956)514-4228
reynaldo.cantu@stisd.net

Instructions:

1. The application form should be completed and signed by an authorized representative of the vendor.
2. The application should be submitted (as noted below) with all supporting documents in PDF format, including but not limited to:
   a. **W-9 Form**
   b. **Conflict of Interest Questionnaire**
   c. Vendor Certification Forms
      - House Bill 89 Verification Form
      - Senate Bill 252 Verification Form
      - Texas Historically Underutilized Businesses (HUB)- TEC 44.031(b)(6) or Small and Minority Firms, Women's Business Enterprises and Labor Surplus Area Firm
      - Felony Conviction Form Certificate of Insurance (as appropriate for on-site professional services)
      - South Texas ISD EDGAR Certifications
   d. South Texas ISD ACH Form (**Optional** "Need to include Bank Verification Letter or Voided Check")
   e. Certification of Criminal History Record Information (**if working directly with students**)
   f. HB 210 / Texas Education Code § 11.067 – Vendor Certification Request (Board Member Relationship / Ownership Disclosure) **(if applicable)**

Notice to Prospective Vendors:

1. Vendors are not placed on the district's approved vendor list until a purchase order is approved by the purchasing department.
2. Vendors must accept purchase orders for all purchases. The district will not be responsible for payment for goods or services that are provided to South Texas ISD staff without an approved purchase order issued by the purchasing department.
3. All invoices must reflect the purchase order number and must be emailed (preferred) or postal mailed to the South Texas ISD Accounts Payable Department (mailing address, fax number and email address are noted below).
4. All payments are net 30 days after receipt of the goods and/or services.

Submit Forms:

South Texas Independent School District -

Purchasing Department
Attn: Reynaldo Cantu
7001 E. Expressway 83
Mercedes, TX 78570
reynaldo.cantu@stisd.net

Submit Invoices to:

South Texas Independent School District -

Account Payables (Vendors #'s-Li)
Attn: Maricruz Moreno
7001 E. Expressway 83
Mercedes, TX 78570
maricruz.moreno@stisd.net

South Texas Independent School District -

Account Payables (Vendors Lo-Z)
Attn: Yolanda Olivo
7001 E. Expressway 83
Mercedes, TX 78570
yolanda.olivo@stisd.net

South Texas Independent School District -

Account Payables (Fleet Rite, HEB, SAM'S, Child Nutrition Vendors, Utilities, Travel)
Attn: Miriam Jimenez
7001 E. Expressway 83
Mercedes, TX 78570
miriam.jimenez@stisd.net

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Vendor Application

Vendor Identification:

Name of Company/Firm: _____

Vendor DBA, if appropriate: _____

Tax ID No. _____

List any Cooperative contracts such as EPCNT, TIPS, Buy Board, etc.

_____

_____

_____

Goods and Services Provided:

_____

_____

_____

Vendor Contact Information:

Vendor Mailing Address: _____

Vendor Remit Address: (if different from mailing address)

_____

Vendor Phone Number: _____

Vendor Fax Number: _____

Vendor Website URL: _____

Vendor Email Address: (for distribution of Purchase Orders)

_____

I hereby certify that the above information is true and correct. I further certify that I am an authorized representative of this vendor.

_____ _____

Vendor Authorized Representative (Print Name) Title

_____ _____

Vendor Authorized Representative (Signature) Date

Please note that completing and submitting this form does not mean you are approved to do business with South Texas ISD. Upon receipt and approval of these form, you will be entered into the district's vendor files.

According to Board approved District policy, only Purchasing Department personnel are authorized to make commitments to purchase for South Texas ISD. South Texas ISD, therefore, assumes no liability for payment obligations except those authorized by a properly executed purchase order issued by the Purchasing Department.

Form **W-9**
(Rev. March 2024)
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.

Before you begin. For guidance related to the purpose of Form W-9, see *Purpose of Form*, below.

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

1 Name of entity/individual. An entry is required. (For a sole proprietor or disregarded entity, enter the owner's name on line 1, and enter the business/disregarded entity's name on line 2.)

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

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

☐ Individual/sole proprietor ☐ C corporation ☐ S corporation ☐ Partnership ☐ Trust/estate

☐ LLC. Enter the tax classification (C = C corporation, S = S corporation, P = Partnership) . . . . .

Note: Check the "LLC" box above and, in the entry space, enter the appropriate code (C, S, or P) for the tax classification of the LLC, unless it is a disregarded entity. A disregarded entity should instead check the appropriate box for the tax classification of its owner.

☐ Other (see instructions)

3b If on line 3a you checked "Partnership" or "Trust/estate," or checked "LLC" and entered "P" as its tax classification, and you are providing this form to a partnership, trust, or estate in which you have an ownership interest, check this box if you have any foreign partners, owners, or beneficiaries. See instructions . . . . . ☐

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

Exempt payee code (if any)

Exemption from Foreign Account Tax Compliance Act (FATCA) reporting code (if any)

(Applies to accounts maintained outside the United States.)

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. See also *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*.

What's New

Line 3a has been modified to clarify how a disregarded entity completes this line. An LLC that is a disregarded entity should check the appropriate box for the tax classification of its owner. Otherwise, it should check the "LLC" box and enter its appropriate tax classification.

New line 3b has been added to this form. A flow-through entity is required to complete this line to indicate that it has direct or indirect foreign partners, owners, or beneficiaries when it provides the Form W-9 to another flow-through entity in which it has an ownership interest. This change is intended to provide a flow-through entity with information regarding the status of its indirect foreign partners, owners, or beneficiaries, so that it can satisfy any applicable reporting requirements. For example, a partnership that has any indirect foreign partners may be required to complete Schedules K-2 and K-3. See the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS is giving you this form because they

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____

Signature of vendor doing business with the governmental entity Date

Conflict of Interest Questionnaire - EXAMPLE PAGE

All individuals or companies being paid by STISD are REQUIRED to complete this form

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

Individual or company name goes here

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 bus you became aware that the originally filed questionnaire was incomplete or inaccur

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

If you have an outside personal relationship or business arrangement with someone who works at STISD, list their name here. If there is no pre-existing relationship, write N/A here.

_____

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.**

If you have a personal relationship or business arrangement with anyone at STISD, please describe it in this section, and answer questions A and B.

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.**

Complete this section if applicable.

Check if applicable

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 & date required from ALL VENDORS

_____ _____

Signature of vendor doing business with the governmental entity 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.

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RIO GRANDE VALLEY | GRADES 6-12

Vendor Certifications
Agreement Funded by U.S. Federal Grant

1. Felony Conviction Notification

Texas Education Agency Code, Section 44.034, Notification of Criminal History, Subsection (a), states "a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony." Subsection (b) states "a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract." This notice is not required of a publicly-held corporation, bu tthe company representative must check off a selection below (A, B, or C).

Initial where applicable.

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

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

☐ C. My compnay is owned and operated by the following individual(s) who has/have been convicted of a felony:
Name of Felon(s):_____
Details of Conviction(s): _____

2. Criminal History Record Information Review of Certain Contract Employees

By signing below, the Vendor or Bidder agrees to comply with Section 22.0834. Criminal History Record Information Review of Certain Contract Employees, Texas Education Code if awarded a contract through this solicitation. The undersigned Vendor or Bidder, if awarded a contract, shall obtain criminal history record information through the criminal history clearinghouse as provided by Section 411.0845, Government Code relating to an employee or applicant who has or will have continuing duties related to the contracted services; and the employee or applicant has or will have direct contact with students. The Vendor or Bidder agrees to certify of the receipt of criminal history record information before or immediately after employing or securing the services of the employee or applicant that has or will have continuing duties related to the contracted services if the employee or applicant has or will have direct contact with students. The Vendor or Bidder further agrees that if awarded a contract, shall assume all expenses associated with the criminal background check and shall immediately remove any employee or agent who was convicted of a felony or misdemeanor involving moral turpitude, as defined by Texas law, from District property or the location where students are present.

☐ None of my employees and any of my subcontractors has or will have continuing duties related to the contracted services; and has or will have direct contact with students. I further certify that my company has taken precautions or imposed conditions to ensure that my employees and any subcontractor will not have continuing duties related to the contracted services; and will not have direct contact with students throughout the term of the Contract.

OR

☐ Some or all of my employees and/or my subcontractors will have continuing duties related to the contracted services; and will have direct contact with students. I further certify that:

3. Debarment and Suspension

By signing below Vendor or Contractor certifies that neither it nor its principals are currently listed on the government-wide exclusions in SAM as debarred, suspended, or otherwise excluded by agencies or declared ineligible under statutory or regulatory authority other than Executive Order 12549. Contractor further agrees to immediately notify the District if he/she is later listed on the government-wide exclusions in SAM, or is debarred, suspended, or otherwise excluded by agencies or declared ineligible under statutory or regulatory authority other than Executive Order 12549.

4. Confidential/Copyrighted Information

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

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Vendor Certifications
Agreement Funded by U.S. Federal Grant

5. Declaration of Business Location- TEC 44.031(b)(8)

By signing below, Vendor and/or Bidder certifies the Vendor, Bidder's or the Bidder's ultimate parent company or majority owner:

☐ A. Has its principal place of business in the State of Texas; **OR**

☐ B. Employs at least 500 persons in the State of Texas; **OR**

☐ C. Principal place of business is not in the State of Texas: _____
(City, State)

6. Owner(s) Name of Business

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

_____ _____
_____ _____
_____ _____
_____ _____

7. Delinquent Taxpayers

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

☐ I am not a delinquent taxpayer to South Texas ISD

☐ I am a delinquent taxpayer to South Texas ISD (Your bid may be disqualified if your debt is not cleared prior to award.)

8. Texas Historically Underutilized Businesses (HUB)- TEC 44.031(b)(6) or Small and Minority Firms, Women's Business Enterprises and Labor Surplus Area Firm

Vendor or Contractor certifies the Vendor's and/or Bidder's company is HUB certified with the State of Texas.

☐ I am an active certified HUB vendor. HUB expiration date: _____

☐ Small and Minority Firms, Women's Business Enterprises and Labor Surplus Area Firms

☐ I am neither.

9. Buy American Provisions

By signing below, Vendor or Contractor certifies that Vendor or Contractor is in compliance with all applicable provisions of the Buy America Act. Purchases made in accordance with the Buy America Act must still follow the applicable procurement rules calling for free and open competition.

10. Prohibition on Contracts with Companies Boycotting Israel- HB89

By signing below, pursuant to Texas Government Code, Chapter 2270, {Vendor} represents and warrants to the District that {Vendor} does not boycott Israel and will not boycott Israel during the term of This Agreement.

11. Non Collusion Statement

By signing below, {Proposer} certifies and represents to South Texas ISD that {Proposer} has not offered, conferred, or agreed to confer any pecuniary benefit, as defined by Section 1.07(a)(6) of the Texas Penal Code, or any other thing of value, as consideration for the receipt of information or any special treatment or advantage relating to this proposal; the {Proposer} also certifies and represents that

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Vendor Certifications
Agreement Funded by U.S. Federal Grant

Vendor } has not offered, conferred or agreed to confer any pecuniary benefit or other things of value as consideration for the recipient's decision, opinion, recommendation, vote or other exercise of discretion concerning this application; the {Vendor } certifies and represents that Vendor has neither coerced nor attempted to influence the exercise of discretion by any officer, trustee, agent or employee of the South Texas School District concerning this application on the basis of any consideration not authorized by law; the Vendor also certifies and represents that Vendor has not received any information not available to other Vendors so as to give the undersigned an advantage with respect to this application; the {Vendor } further certifies and represents that {Vendor } has not violated any state, federal or local law, regulation or ordinance relating to bribery, improper influence, collusion or the like and that Vendor will not in the future, offer, confer, or agree to confer any pecuniary benefit or other thing of value of any officer, trustee, agent or employee of the South Texas Independent School District in return for the person having exercised the person's official discretion, power or duty with respect to this application; the Vendor certifies and represents that it has not now and will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any office, trustee, agent or employee of the South Texas Independent School District in connection with information regarding this application, the submission of this application, the award of contracts, application or the performance, delivery or sale pursuant to this application or future contracts or business; the

{Vendor} certifies that the vendor has not prepared this application and will not prepare any future applications arising from this vendors application in collusion with any other respondent, and that the content of any future applications arising out of this vendor application will not be

communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the District's

12. Prohibition on Contracts with Companies Engaged with Iran, Sudan or Foreign Terrorist Organization- SB252

By signing below, {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, the government of Iran, the government of Sudan, or a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State.

13. Applicable to Grants, Subgrants, Cooperative Contracts, and Contracts Exceeding $100,000 in Federal Funds

Submission of this certification is a prerequisite for making or entering into this transaction and is imposed by section 1352, Title 31, U.S. Code. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Any person who fails to file the required certification shall be subject to civil penalty of not less than $10,000 and not more than $100,000 for each such failure. The undersigned certifies, to the best of his/her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid or 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 Contract, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative Contract.

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 Contract, 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 sub-recipients shall certify and disclose accordingly.

14. Equal Employment Opportunity

In fulfilling its obligations under the Agreement, Vendor shall comply with E.O. 11246, "Equal Employment Opportunity," as amended by E.O. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

15. Rights to Inventions Made Under a Contract or Agreement

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Vendor Certifications
Agreement Funded by U.S. Federal Grant

To the extent that the Agreement requires the performance of experimental, developmental or research work, Proposer agrees that the District shall have rights in any resulting invention in accordance with 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 District from which received financial assistance to carry out the work contemplated by the Agreement.

16. Clean Air Act (42 U.S.C. § 7401 et seq.) and the Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), as amended

In the event that the fees payable to Vendor under the Agreement exceed $100,000, Proposer agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. § 7401 et seq.) and the Federal Water Pollution Control Act as amended (33 U.S.C. § 1251 et seq.). Violations shall be reported to the Awarding Agency and the Regional Office of the Environmental Protection Agency (EPA).

17. Byrd Anti-Lobbying Amendment (31 U.S.C.§ 1352)

In the event that the fees payable to Vendor under the Agreement exceed $100,000, Proposer shall file the certification required under 31 U.S.C. § 1352. Each tier shall certify 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 shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures shall be forwarded from tier to tier up to the Vendor.

18. Access to Records

Vvendor agrees that the Inspector General of the District or any of their duly authorized representatives shall have access to any books, documents, papers and records of the Proposer that are directly pertinent to Proposer's discharge of its obligations under the Agreement for the purpose of making audits, examinations, excerpts and transcriptions.

19. Applicability to Selected Vendors

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

I, the undersigned agent for the firm named below, certify that the information stated above has been reviewed by me and the information furnished is true to the best of my knowledge.

Vendor Name: _____

Address, City, State, Zip Code: _____

Phone Number: _____

Printed Name of Authorized Representative: _____

Title of Authorized Representative: _____

Email Address: _____

Signature of Authorized Representative: _____

Date: _____

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Phone: 956.565.2454
Web: www.stisd.net
7001 E. Expressway 83, Mercedes, TX 78570

ACH Vendor Direct Deposit Form

Section 1: Payee Information (all information is REQUIRED)			
Payee Name		TIN/EIN or SS#	
Payment Address	City	State	Zip Code
Accounting/ACH Contact Name			
Email Address for Remittance Advice *Required*		Phone Number	

Section 2: Financial Institution Information (all information is REQUIRED)			
Financial Institution Name			
Financial Institution Address	City	State	Zip Code
Routing Transit Number**	Customer Account Number	Type of Account	
		◯ Checking	◯ Savings

** Please provide the 9 digit bank routing number from a check. The routing number from a deposit slip is invalid.

Submit a copy of voided check or bank verification with this form.

Section 3: Authorization for Direct Deposit Setup (REQUIRED)
I (we) hereby authorize South Texas Independent School District, hereinafter to initiate automatic credit entries, and if necessary, to initiate automatic debit entries for adjustments for any credit entries in error to my (our) account identified below, and the financial institution named below to credit and/or debit the same to such account, for payment of goods and/or services.
This authorization is to remain in full force and effect until South Texas Independent School District has received written notification of its termination in such manner as to afford South Texas ISD and the Financial Institution a reasonable opportunity to act on it.

Authorized Signature	Printed Name	Date

NOTE This form will not be processed unless we receive the voided check and/or bank verification letter.

REV. 1/15/2026

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Criminal History Record Information for Contracted Services

CONFIDENTIAL

The Texas Education Code Section 22.0834 authorizes the District to obtain criminal history information on an employee of, or applicant for employment by, a person that contracts with the District to provide services if: the employee or applicant has or will have continuing duties related to the contracted services and the duties are or will be performed on school property or at another location where students are regularly present.

The information requested below is necessary to obtain criminal history record information.

Vendor Name: _____

Campus/Department Originating Contract: _____

Last Name: _____ First Name _____ MI: _____

Social Security Number: _____ Date of Birth: _____

Sex: ☐ Male ☐ Female Ethnicity: ☐ Black ☐ White/Other

I hereby authorize the South Texas Independent School District to obtain from any law enforcement agency or criminal justice agency all criminal history record information that relates to me.

Note to Contractors: The information you are providing about age, sex, and ethnicity will not be used to determine eligibility for award of a contract but will be used solely for the purpose of obtaining criminal history record information.

_____ _____

Signature Date

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7001 E. EXPRESSWAY 83, MERCEDES, TX 78570
P: 956.565.2454
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RE: HB 210 / Texas Education Code § 11.067 – Vendor Certification Request (Board Member Relationship / Ownership Disclosure)

Dear Vendor:

The South Texas Independent School District is conducting a compliance review of future vendors in light of Texas House Bill 210 (89th Legislature, Regular Session), which added Texas Education Code § 11.067, effective September 1, 2025. This statute addresses certain prohibited relationships and benefits involving school district vendors and members of a district's board of trustees and creates criminal penalties for vendors in certain circumstances.

To support the District's compliance efforts and to confirm that our records are current, please review the requested information below and return the completed certification/disclosure (Attachment A) by:

SUMMARY OF INFORMATION REQUESTED (HB 210 / TEC § 11.067)
For purposes of this request, TEC § 11.067 includes (among other items) the following concepts:
• "Substantial interest" generally includes ownership of more than 10% of voting interest in a vendor, or a direct/indirect interest in more than 10% of the profits/proceeds/capital gains of the vendor.
• The statute also addresses certain relationships in the second degree by consanguinity or affinity (as determined under Texas Government Code, Chapter 573).
• The statute also addresses whether a trustee has received or has been promised gifts or in-kind services valued at more than $250, and whether a trustee has been compensated as consideration for the District entering into a contract.

REQUEST
Please complete Attachment A and provide the following:

1) Disclosure of any individual/entity with a "substantial interest" in your organization (as described above).
2) Confirmation whether any member of the District's Board of Trustees (or, as applicable, a related individual) has a substantial interest in your organization or in any subcontractor you use for District work.
3) Confirmation regarding gifts/in-kind services and compensation as described in TEC § 11.067.

If your company believes there may be a relationship or circumstance that could implicate TEC § 11.067, please disclose that information in Attachment A and contact us promptly so the District can review and determine appropriate next steps.

This request is for District compliance/administrative purposes and is not legal advice to your organization. Vendors may wish to consult their legal counsel regarding HB 210 / TEC § 11.067.

Thank you for your prompt attention and cooperation.

Enclosure: Attachment A – HB 210 / TEC § 11.067 Vendor Certification & Disclosure

SANDRA GARZA OCHOA, PH.D. , CSC, LPC, CRC, BCBA
Superintendent

EFRAIN GARZA
Deputy Superintendent

MARLA R. KNAUB
Assistant Superintendent for Finance & Operations

LISSA FRAUSTO, MBA, SPHR
Assistant Superintendent for Human Resources

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ATTACHMENT A

HB 210 / TEXAS EDUCATION CODE § 11.067
VENDOR CERTIFICATION & DISCLOSURE

Vendor Legal Name: _____
DBA (if any): _____
Vendor Address: _____
Primary Contact Name/Title: _____
Email/Phone: _____

District Contract / PO / Agreement Reference (if known):
_____

1) OWNERSHIP / "SUBSTANTIAL INTEREST" DISCLOSURE
List each individual/entity that owns, directly or indirectly, MORE THAN 10% of the voting interest in the Vendor, or has a direct/indirect participating interest in MORE THAN 10% of the profits/proceeds/capital gains of the Vendor.

(If none, write "None." If additional space is needed, attach a separate sheet.)

Name (Individual/Entity)	Interest Type (Voting/Profit)	Percentage	Notes
_____	_____	_____%	
_____	_____	_____%	
_____	_____	_____%	

2) BOARD MEMBER / RELATED INDIVIDUAL RELATIONSHIP DISCLOSURE
To the best of Vendor's knowledge, based on reasonable inquiry:

☐ A. NO. No individual serving on the District's Board of Trustees has a substantial interest in the Vendor.
☐ B. NO. No individual serving on the District's Board of Trustees is related in the second degree (consanguinity or affinity, as determined under Texas Government Code Chapter 573) to an individual who has a substantial interest in the Vendor.
☐ C. YES / POSSIBLY. There may be a relationship or circumstance that could be relevant under TEC § 11.067.
Explain fully (include names, relationship, and ownership details):
_____
_____
_____

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Superintendent

EFRAIN GARZA
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3) SUBCONTRACTORS USED FOR DISTRICT WORK (IF APPLICABLE)
List any subcontractor(s) the Vendor uses or anticipates using for District-related goods/services under this engagement.

Subcontractor Name: _____ Scope: _____

Subcontractor Name: _____ Scope: _____

To the best of Vendor's knowledge, based on reasonable inquiry:

☐ D. NO. No District trustee has a substantial interest in any subcontractor hired/used by Vendor for District work.
☐ E. YES / POSSIBLY. Explain fully:

_____
_____

4) GIFTS / IN-KIND SERVICES / COMPENSATION CERTIFICATION (TEC § 11.067)
To the best of Vendor's knowledge, based on reasonable inquiry:

☐ F. Vendor certifies that no individual serving on the District's Board of Trustees has received or has been promised
a gift or in-kind services with a value of more than $250 from Vendor (including Vendor's agents/representatives) in connection with District business.

☐ G. Vendor certifies that Vendor has not directly or indirectly (including through a third party) compensated any District trustee with money, gifts, or in-kind services as consideration for the District entering into a contract with Vendor.

☐ H. EXCEPTION / DISCLOSURE. Vendor cannot make one or more of the certifications above. Explain fully:

_____

_____

_____

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Superintendent

EFRAIN GARZA
Deputy Superintendent

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CERTIFICATION

I certify that I am authorized to sign on behalf of the Vendor. I further certify that the information provided in this
Attachment A is true and correct to the best of my knowledge after reasonable inquiry.

Authorized Representative (Print Name): _____
Title: _____
Signature: _____
Date: _____

SANDRA GARZA OCHOA, PH.D., CSC, LPC, CRC, BCBA
Superintendent

EFRAIN GARZA
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Contractor/Volunteer Background Authorization Form

☐ Contractor ☐ Volunteer ☐ Other _____

Campus/ Department: _____
Position/Title: _____

An Equal Opportunity/Affirmative Action Employer

South Texas ISD does not discriminate on any basis prohibited by applicable law including race, color, religion, sex, national origin, disability, age, citizenship status, or veteran's status in recruitment, employment, promotion, compensation, benefits or training. The information on this form is the property of South Texas ISD.

Provide legal name as it appears on Social Security Card.

Last Name	First Name	Middle Initial	Date of Birth
Address: Number and Street	City	State	Zip Code
ID/Driver's License Number	Expiration Date	Issuing State	SSN
Contact Phone Number	Email Address		

Former names used:

South Texas ISD may obtain background information, including criminal history record. I understand this information will be used only for evaluation of contractor/volunteer services with South Texas ISD.

I hereby authorize the Texas Department of Public Safety or any other entity authorized to access state or federal agency records to furnish South Texas ISD or its agent, my background records. I do hereby release all agents, servants, and employees of South Texas ISD, the person in charge of any law enforcement agency or department and all members of such law enforcement agency or department from all liability resulting from the release of this information. *With few exceptions, you have the right to request, receive, review and correct information about yourself collected using this form.*

The following are my responses to questions about my criminal history, if any. (Exclude minor traffic offenses punishable only by fine.)

Are you related to an employee of South Texas or a member of the Board of Trustees? Yes ☐ No ☐

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If yes, include name(s), title(s), department(s), relationship _____

_____

Except for minor traffic violations such as parking or speeding, have you ever been convicted, fined, placed on probation, given a suspended sentence, given deferred adjudication, or forfeited bail in connection with any violation of law (misdemeanor or felony), regardless of any subsequent court dismissal, sealing or expungement?	Yes	No
Have you ever been convicted of, plead guilty or 'no contest' (nolo contender) to, or received probation, suspension, or deferred adjudication for a felony or any offense involving moral turpitude (including but not limited to, theft, rape, murder, swindling, and indecency with a minor)?	Yes	No

If you answered yes to any of these questions, please provide details below (Conviction of a crime is not an disqualify you, however, South Texas ISD will consider the nature and date of the offense). Attach extra pages if needed.

State _____ County _____ Date of Offense(MM/DD/YY) _____

Details: _____

_____

State _____ County _____ Date of Offense(MM/DD/YY) _____

Details: _____

_____

I hereby certify that all information provided by me on this form is true, complete and correct.
I understand that any false statements made herein may void my application for contract/volunteer services with South Texas ISD.

Contractor/Volunteer Signature _____ Date _____

Please send Criminal Background Check forms and copy of driver's license or ID to Human Resources for processing return form to Lidia Faz - Human Resources Specialist lidia.faz@stisd.net.

*If awarded Contractors will need to fill-out this form