REQUEST FOR JOC ORDER CONTRACT

JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025
SCI CTE Automotive Expansion 2025

JOC PROPOSAL ITEM: SCI CTE Automotive Expansion 2025, 900 Med High Dr, Mercedes, Texas 78570

DEADLINE: Tuesday, April 8, 2025
2:00 p.m. (CST)

JOC 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/community/public

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

ATTN: Ms. Marla R. Knaub,
South Texas ISD Administration
7001 E. Expressway 83., Mercedes, TX 78570.
JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025

Due Date: JOC Proposals will be accepted until Tuesday, April 8, 2025, at 2:00 p.m. CST

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 No proposal be withdrawn for a period of sixty (60) days.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

Ms. Marla R. Knaub
Assistant Superintendent of Finance & Operations
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 Job Order Contract for:

SCI CTE AUTOMOTIVE EXPANSION 2025, MERCEDES, 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 Mar. 21, 2025.This Request for Job Order Contract ("JOC") 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 JOC provides the information necessary to prepare and submit Job Order Contract 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: CTE Automotive Expansion for South Texas ISD Science Academy

South Texas Independent School District – Science Academy to be located at 900 Med High Dr, Mercedes, Texas 78570. 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 Mar. 21, 2025.

3. *Points-of-Contact*.

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

Dr. Marco Antonio Lara Jr., Ed. D
Superintendent of Schools South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570
Telephone: 956-565-2454
Mail: tony.lara@stisd.net

Marla Knaub,
Assistant Superintendent for Finance & Operations South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570
Telephone: 956-514-4222
E-Mail: marla.knaub@stisd.net

Frank Trevino, Construction Manager South Texas Independent School District
7001 E. Expressway 83.
Mercedes, TX 78570
Telephone: 956-514-4266
E-Mail: 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
E-Mail: dmonreal@gmsarchitects.com

Respondents shall restrict its contact with the Owner and direct all questions regarding this JOC, 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 JOC 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 **": SCI CTE Automotive Expansion 2025 JOC Proposal # JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025** and bearing the name and address of the Proposer. JOC 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: Marla R. Knaub, Assistant Superintendent of Finance & Operations, South Texas Independent School District, 7001 E. Expressway 83., Mercedes, TX 78570 prior to **2:00 o'clock p.m. CST, April 8, 2025.** 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 **JOC *Attachment A***.

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

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

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

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

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

H. SIGNATURE PAGE: Complete, sign and submit Signature Page, ***JOC 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 **JOC 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 JOC, 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 **JOC 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 RFQ, 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 RFQ 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.

JOC ATTACHMENT A

BID PROPOSAL FORM
(GENERAL CONTRACT)

Project: South Texas Ind. School District
SCI CTE AUTOMOTIVE EXPANSION 2025
JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025
900, Med High Dr., Mercedes, Texas

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

Date: April 8, 2025

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 ($)

B. ALTERNATES:
Alternate No. 1: Work consists of Demolition of existing CMU walls to an existing exterior can wash area and providing a New Storage Room located plan west side constructed of metal building components.___
_____
_____
_____DOLLARS($)

Alternate No. 2: Work consists of Demolition of existing CMU wall and overhead doors and providing New CMU wall and overhead doors to enclose existing outdoor space to the automotive area on plan north side._____
_____
_____DOLLARS($)

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 **2** 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 be required to substantially complete the project on or before August 1, 2025 and reach final completion by September 1, 2025. (Refer to District's Instructions to Bidders.)
b. Liquidated Damages: STISD shall have the right under the Contract to assess liquidated damages for each and every calendar day beyond the Substantial Completion Date set out in the Contract that the Work fails to be substantially complete in the following amount per day: $1,500.00
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 **2** 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

JOC 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.

   Purchasing Cooperative: _____
   (BuyBoard, Tips, Choice Partners, etc.) To view list of Cooperatives STISD is part of
   https://www.stisd.net/facultystaff/business-office

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 JOC, 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 JOC, 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 JOC. 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 JOC.

JOC 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: _____

JOC 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

JOC 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.

JOC 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 JOC, 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 Ind. School District»«»
«7001 E. Expressway 83
Mercedes, Texas 78570»
«Telephone Number: 956-565-2454»
«»

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

« »« »
« »
« »
« »

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

«South Texas Ind. School District
CTE Automotive Expansion»
«Mercedes, Texas»
« »

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

«Gomez Mendez Saenz, Inc.»«»
«1150 Paredes Line Rd.
Brownsville, Texas 78521»
«Telephone Number: 956-546-0110»
«Fax Number: 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.



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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

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, 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.

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

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

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

« »

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.)

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

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[« »] By the following date: « »

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

Portion of Work	Substantial Completion Date

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

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 « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

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

« »

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

« »

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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 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(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 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;
- **.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.)

« »

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 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.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, 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, 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 Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 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, or as follows:

« »

§ 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.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

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§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

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

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)

«»
«7001 E. Expressway 83
Mercedes, Texas 78570»
«Telephone Number: 956-565-2454»
«»
«»
«»

§ 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.

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§ 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.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

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

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 Building information modeling exhibit, dated as indicated below:
(Insert the date of the building information modeling exhibit incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

« »

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[« »] The Sustainability Plan:

Title	Date	Pages

[« »] 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.)

« »

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«»«»	« »« »
(Printed name and title)	*(Printed name and title)*

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

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

«South Texas Ind. School District
CTE Automotive Expansion»
«Mercedes, Texas»

THE OWNER:
(Name, legal status and address)

«South Texas Ind. 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»

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15 CLAIMS AND DISPUTES

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

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 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 may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 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.

§ 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 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 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.

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§ 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.

§ 1.2.2 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.

§ 1.3 Capitalization

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

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. 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 the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 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 written protocols governing the use of, and reliance on, the information contained in the model 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.

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ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

§ 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 to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 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. The Contractor shall be entitled to rely on the accuracy of

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information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 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 Contract 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 Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract 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 duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 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 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. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 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, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 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.

§ 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 not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the

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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.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect 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 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. 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. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 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.

§ 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.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 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 consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 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.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects,

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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, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 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

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 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.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, 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 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 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 and all required taxes, less applicable trade discounts;

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.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 shall be adjusted accordingly by Change Order. The amount of the Change Order shall 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.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent 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.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 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.

§ 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 general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 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.

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

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

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

§ 3.12.5 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 coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 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.

§ 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, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this

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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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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.

§ 3.14 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. 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.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 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.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 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 hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, 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 (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, 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 a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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§ 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 Section 3.18.1 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 workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

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

§ 4.1.2 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, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 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. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 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 has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. 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 to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken

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in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 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 decide matters 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 and decisions 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 decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

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 may notify the Contractor whether the Owner or the Architect (1) has

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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.

§ 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.

§ 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. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, 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.

§ 5.3 Subcontractual Relations

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. 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.

§ 5.4 Contingent Assignment of Subcontracts

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

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to

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those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage 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.

§ 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 of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. 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. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

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

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

§ 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 Architect 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.

§ 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.

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§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

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

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

§ 7.3 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 Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

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

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

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.2** Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- **.3** Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- **.4** Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- **.5** Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved 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 Contract Time.

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

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum 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.

ARTICLE 8 TIME

§ 8.1 Definitions

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

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 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 confirms 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 Substantial Completion within the Contract Time.

§ 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) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the

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Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

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.

§ 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 shall be equitably adjusted.

§ 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, 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, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 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 if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 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.

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§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) 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 (3) 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.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data 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.

§ 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;
- **.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.

§ 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.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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§ 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.

§ 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 obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 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 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 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.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 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.

§ 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

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included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, 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.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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 Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer 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. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, 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, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 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 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 stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance 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.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) 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) a certificate evidencing 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) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the 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

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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.

§ 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, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 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 made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 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 and other persons who may be affected thereby;
- **.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 trees, shrubs, lawns, walks, 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 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.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the

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extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

If either party 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, notice of the 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.

§ 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.

§ 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. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, 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 (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

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§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. 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.

§ 11.2 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 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 three (3) 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

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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.

§ 11.3 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 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.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 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 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.

§ 11.5.2 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. If the Contractor does not object, 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.

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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 request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, 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 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 failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 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 after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 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 be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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.

§ 12.3 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.

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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. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 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 Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 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 as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. 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. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including 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.

§ 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.

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§ 13.5 Interest

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

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 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 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 seven 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; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven 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.

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§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.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; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 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 Substantial Completion of the Work. The Owner and Contractor waive 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 either the Owner or 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 notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 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 had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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§ 15.2.3 In evaluating Claims, the Initial Decision Maker 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 Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker 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 the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, 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 Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

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§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 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.

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APPENDIX B
PREVAILING
WAGE

"General Decision Number: TX20240255 11/22/2024

Superseded General Decision Number: TX20230255

State: Texas

Construction Type: Building

County: Hidalgo County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all

	hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2024
1	08/23/2024
2	11/22/2024

BOIL0074-003 07/01/2023

	Rates	Fringes
BOILERMAKER	$ 37.00	24.64

ENGI0178-005 06/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane	$ 32.85	13.10
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic Crane 60 tons and above	$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under	$ 32.35	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

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* SUTX2014-031 07/21/2014

	Rates	Fringes
BRICKLAYER	$ 16.17 **	0.00
CARPENTER	$ 14.21 **	2.22
CEMENT MASON/CONCRETE FINISHER	$ 12.46 **	0.00
ELECTRICIAN	$ 18.44	4.53
INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation)	$ 11.54 **	2.17
IRONWORKER, REINFORCING	$ 12.01 **	0.00
IRONWORKER, STRUCTURAL	$ 15.04 **	4.34
LABORER: Common or General	$ 8.00 **	0.00
LABORER: Mason Tender - Brick	$ 10.00 **	0.00
LABORER: Mason Tender - Cement/Concrete	$ 10.89 **	0.96
LABORER: Pipelayer	$ 11.00 **	3.47
LABORER: Roof Tearoff	$ 10.06 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 14.04 **	1.01
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 13.93 **	0.00
OPERATOR: Bulldozer	$ 18.29	1.31
OPERATOR: Drill	$ 16.22 **	0.34
OPERATOR: Forklift	$ 14.83 **	0.00

OPERATOR: Grader/Blade.....$ 10.00 ** 0.00

OPERATOR: Loader.....$ 12.87 ** 0.70

OPERATOR: Mechanic.....$ 17.00 ** 0.00

OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....$ 16.03 ** 0.00

OPERATOR: Roller.....$ 12.70 ** 0.00

PAINTER (Brush, Roller, and Spray).....$ 11.27 ** 0.00

PIPEFITTER.....$ 15.22 ** 3.16

ROOFER.....$ 11.42 ** 0.00

SHEET METAL WORKER (HVAC Duct Installation Only).....$ 18.40 2.12

SHEET METAL WORKER, Excludes HVAC Duct Installation.....$ 21.13 6.53

TILE FINISHER.....$ 11.22 ** 0.00

TILE SETTER.....$ 12.15 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 12.39 ** 1.18

TRUCK DRIVER: Flatbed Truck.....$ 19.65 8.57

TRUCK DRIVER: Semi-Trailer Truck.....$ 12.50 ** 0.00

TRUCK DRIVER: Water Truck.....$ 12.00 ** 4.11

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.20) or 13658 ($12.90). Please see the Note at the top of the wage

determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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.

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 classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were

prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which 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. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that
no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of 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. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of

each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the ""SA"" identifier indicate that
the prevailing wage rate set by a state (or local) government was 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. 01/03/2024 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:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write 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 the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write 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 by 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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

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 JOB ORDER CONTRACT

PROJECT and PROJECT NO:

SCI CTE Automotive Expansion 2025
Mercedes, Texas
Job Contract #: JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025

DUE DATE AND TIME:

Tuesday, April 8, 2025 @ 2:00 p.m. C.S.T.
South Texas ISD – Administration
7001 E. Expressway 83
Mercedes, Texas 78570

PRE-BID CONFERENCE & SITE VISITS:

Wednesday, April 2, 2025 @ 10:00 a.m. C.S.T.
South Texas ISD – Administration
7001 E. Expressway 83
Mercedes, Texas 78570

Proceed to Science Academy
900 Med High Dr.
Mercedes, Texas 78570

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/community/public

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 Job Order Contract for **SCI CTE Automotive Expansion 2025, Job Order Contract #: JOCPROJ – SCI CTE Automotive Expansion 2025** no later than 2:00 PM CST, Tuesday, April. 8, 2025. Late submittals will not be considered. South Texas ISD will be accepting sealed JOC 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 **SCI CTE Automotive Expansion 2025, Job Order Contract JOCPROJ – SCI CTE Automotive Expansion 2025**.

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 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

C. Work Schedule and Completion Time

- Notice to Proceed (NTP) is expected to be issued the day after the April Board Meeting. (Meeting tentatively scheduled for April 22, 2025)
- The Project shall have a Substantial Completion no later than August 1, 2025.
- The Project shall have a Final Completion no later than September 1, 2025.

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
    e. Professionalism and Conflict Resolution
    f. Change Order Processing
    g. Safety Record
3. FINANCIAL STRENGTH (20%)

a. Financial Statements
    i. Independent Audited Financial Statements
    ii. Review Audit or Compilation Report
    iii. Bank Reference(s)

b. Bonding
    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

South Texas ISD

SCI CTE Automotive Expansion 2025

MERCEDES, TEXAS

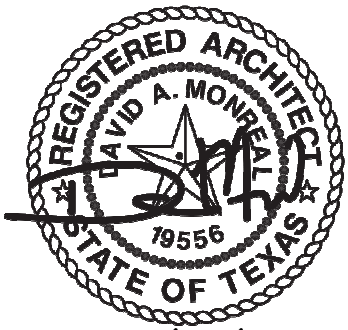
JOCPROJ – SCI CTE AUTOMOTIVE EXPANSION 2025

ARCHITECTS - PLANNERS

Gomez Mendez Saenz, Inc.

CONSULTANTS

Green Rubiano & Associates
Javier Hinojosa Engineering
Ethos Engineering
SSP Design



3/21/25

GMS ARCHITECTS

David Monreal, AIA

Set No.

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DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL

A. South Texas ISD SCI CTE Automotive Expansion 2025

B. City of Mercedes

C. Mercedes, Texas 78570

D. Architect Project No.

E. GMS ARCHITECTS

F. GMS Architects

G. 1150 Paredes Line Road

H. Brownsville, TX 78521

I. Phone: 956.546.0110

J. Issued: March 21, 2025

END OF DOCUMENT 000101

DOCUMENT 002513 - PREBID MEETINGS

1.1 PREBID MEETING

A. **Owner** and **Architect** will conduct a Prebid meeting as indicated below:

1. Meeting Date: April 2, 2025.
2. Meeting Time: 10:00am local time.
3. Location: South Texas ISD Administration Building
   7001 W Expy 83
   Mercedes, Texas 78570

B. Attendance:

1. Prime Bidders: Attendance at Prebid meeting is recommended.
2. Subcontractors: Attendance at Prebid meeting is recommended.

C. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:

   a. Advertisement for Bids.
   b. Instructions to Bidders.
   c. Bidder Qualifications.
   d. Bonding.
   e. Insurance.
   f. Bid Security.
   g. Bid Form and Attachments.
   h. Bid Submittal Requirements.
   i. Notice of Award.

2. Communication during Bidding Period:

   a. Obtaining documents.
   b. Bidder's Requests for Information.
   c. Bidder's Substitution Request/Prior Approval Request.
   d. Addenda.

3. Contracting Requirements:

   a. Agreement.
   b. The General Conditions.
   c. The Supplementary Conditions.
   d. Other Owner requirements.

4. Construction Documents:

   a. Scopes of Work.
   b. Temporary Facilities.

c. Use of Site.
d. Work Restrictions.
e. Alternates, Allowances, and Unit Prices.
f. Substitutions following award.

5. Separate Contracts:

a. Work by Owner.

6. Schedule:

a. Project Schedule.
b. Contract Time.
c. Liquidated Damages.
d. Other Bidder Questions.

D. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes and will issue thru an Addendum to all parties on project bidders list.

1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 002513

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

GREEN, RUBIANO & ASSOCIATES

Structural Engineers
Firm Registration #: F-4145

1220 West Harrison
Harlingen, Texas 78550
(956) 428-4461
www.graengineering.com

Project Memorandum

Date: March 20, 2025

To: David Monreal, A.I.A.
GMS Architects
Brownsville, TX

Sent via email : dmonreal@gmsarchitects.com

GRA Project#: 192-623
Project: SoTX ISD CTE Campus Renovation 2025
Re: Roof Components, Exterior Claddings & Fenestrations Design Wind Pressures

Below are the design wind pressures for roof components, exterior wall claddings and fenestration assemblies for the referenced project. Please make reference to these design wind pressures, and the associated roof diagram illustrated on our drawings, in your specifications and contract documents for metal roof panels, overhead doors, fiberglass doors, and any other roof component, exterior wall cladding, or fenestration assembly included on this project.

Roofing assemblies and components shall be tested in accordance with ASTM E1592, FM 4474 or UL 580.

Please make reference to the Design Criteria, Project Windstorm Requirements, and Exterior Components & Claddings notes on the General Structural Notes sheets for additional information. The roof components, exterior wall claddings and fenestrations, and anchoring of these items to the structure shall be tested per the building code requirements to meet the following service design wind pressures:

Roofing Systems & Roof Components			Exterior Wall Claddings, Door & Window Fenestrations	
Zone 1	Zone 2	Zone 3	P+ (towards the surface)	P- (away from the surface)
- 34 psf	-50 psf	-68 psf	+22 psf	-29 psf

ASCE 7-16 Section 29.4.1	
Ultimate Design Wind Speed	135 mph
Risk Category	II
Exposure Category	C
Internal Pressure Coefficient (GCpi)	+/- 0.18

We appreciate the opportunity to assist you with this project. Please feel free to contact us if you have any questions.

Sincerely,



Rolando R. Rubiano, P.E.

CC: Celia Monreal & Isaac Ochoa (GMS Architects)

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Owner-furnished/Contractor-installed (OFCI) products.
4. Contractor's use of site and premises.
5. Work restrictions.
6. 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: South Texas ISD SCI CTE Automotive Expansion 2025

Project Locations:

South Texas ISD Science Academy
900 Med High Drive
Mercedes, TX 78570

B. Owner: South Texas Independent School District

1. Owner's Representative: South Texas ISD
Frank Trevino
7001 W Expy 83
Mercedes, TX 78570
956-733-2217
Frank.Trevino@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. Structural Consultant: Green, Rubiano & Associates

Rolando Rubiano, P.E.
1220 W. Harrison Ave.
Harlingen, Tx 78550
956-428-4461
rrubiano@graengineering.com

2. Civil Consultant: Javier Hinojosa Engineering.
Javier Hinojosa
416 E. Dove Avenue
McAllen, Tx 78504
956-668-1588
javier@javierhinojosaeng.com

3. MEP Consultant: Ethos Engineering
Guillermo Quintanilla and
Cesar Gonzalez P.E.
1126 South Commerce St.
Harlingen, Tx 78550
956-230-3435
gquin@ethoseng.net
cgonzalez@ethoseng.net

4. Landscape Consultant: SSP Design
Scott Pajeski
789 East Washington Street
Brownsville Tx 78520
956-547-9788
spajeski@sspdesign.com

E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. South Texas ISD SCI CTE Automotive Expansion 2025:

Work includes - Existing single-story building: (Base Bid) work consists of Demolition of existing CMU walls, lockers and restrooms. Providing New CMU walls to enclose existing outdoor space to the automotive areas. On plan south side, new restrooms and personal storage and repaint existing automotive areas. It will also include sitework, new concrete drive and interior finishes. (Alternate #1) work consists of Demolition of existing CMU walls to an existing exterior can wash area and providing a New Storage Room located plan west side constructed of metal building components. (Alternate #2) work consists of Demolition of

existing CMU wall and overhead doors and providing New CMU wall and overhead doors to enclose existing outdoor space to the automotive area on plan north side. Other work indicated in Construction Documents.

B. Type of Contract: Job Order Contract

1. Project will be constructed under a single prime contract.

1.4 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. N/A

1.5 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.

1.6 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

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.

1.7 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 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. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.

C. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.

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 $125,000.00 for use according to Owner's written instructions.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the 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.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

Alternate No. #1 – Existing Building: Demolition of existing CMU walls to an existing exterior can wash area and providing a New Storage Room located plan west side constructed of metal building components. Provide the ADD cost for the contractor to provide and install finishes, structural, electrical, and all necessary parts for renovation.

Alternate No. #2 – Existing Building: Demolition of existing CMU wall and overhead doors and providing New CMU wall and overhead doors to enclose existing outdoor space to the automotive area on plan north side Provide the ADD cost for the contractor to provide and install finishes, structural, electrical, and all necessary parts for new construction.

END OF SECTION 012300

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 14 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.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

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 10 photographs to show existing conditions adjacent to property before starting the Work.

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. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.
6. Base of wall flashing and waterproofing
7. Door and Window fastening, flashing and waterproofing.
8. Roofing Installation, including base fastening, roofing ply installation, and parapet waterproofing.
9. Metal Wall Panel Installation, including fastening and waterproofing.

E. Periodic Construction Photographs: Take 15 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

F. Aerial Construction Photographs: Take aerial photographs (North, South, East, West) monthly and submit with each month’s application for payment until the project is substantially complete

G. Final Completion Construction Photographs: Take 20 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 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner, Architect, Architects Consultants, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Provide connections and extensions of services and metering as required for construction operations.

C. Electric Power Service from Existing System: Provide connections and extensions of services and metering as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
2. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall, providing minimum 10.0-Mbps upload and 15 -Mbps download speeds at each computer.
3. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.

2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as required for proper access onto and around the project site.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas on Project Site for construction personnel. Coordinate locations with construction activities.

E. Storage and Staging: Use designated areas of Project site for storage and staging needs. Coordinate locations with construction activities.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Elevator Use: Use of elevators is not permitted. (If Applicable)

L. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

N. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

O. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings,

requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

I. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

L. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

N. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Provide walk-off mats at each entrance through temporary partition.

O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.

5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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 016050 - PRODUCTS AND SUBSTITUTIONS

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: "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials", is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self explanatory and have recognized meanings in the construction industry.

Substitutions: The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to contract documents, where requested by Owner, Architect or Engineer, are "changes" not "substitutions." Substitutions requested during bidding period, which have been accepted prior to Contract Date, are included in contract documents and are not subject to requirements for substitutions as specified herein. Contractor's determination of an compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions;" and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, Contractor's requests for changes in products, materials and methods of construction required by contract documents are considered requests for "substitutions," and are subject to requirements hereof.

Standards: Refer to Division 1 section "Definitions and Standards" for applicability of industry standards to products of project, and for acronyms used in text of specification sections.

QUALITY ASSURANCE:

Source Limitations: To the greatest extent possible, for each unit of work, provide products, materials or equipment of a singular generic kind and from a single source.

Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or material, select an option which is compatible with other products and materials already selected (which may have been from among options for those other products and materials). Total compatibility among options is not assured by limitations within contract documents, but must be provided by Contractor. Compatibility is a basic general requirement of product/material selections.

SUBMITTALS:

Requests for Substitutions: Submit 3 copies, fully identified for product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal to or better than work originally indicated.

PRODUCT DELIVER STORAGE HANDLING:

General: Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Control delivery schedules to minimize long term storage of products at site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

WARRANTIES (GUARANTEES):

Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of these specifications:

Special Project Warranty (Guarantee): A warranty specifically written and signed by Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.

Specified Product Warranty: A warranty which is required by contract documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of a product into the work, or has written and executed a special product warranty as a direct result of contract document requirements.

Coincidental Product Warranty: A warranty which is not specifically required by contract documents (other than as specified in this Section); but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.

Refer to individual sections of Divisions 2 through 16 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform as required, and against deficient, defective and

faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the work which result from: 1.) Unusual and abnormal phenomena of the elements, 2.) The Owner's misuse, maltreatment or improper maintenance of the work, 3.) Vandalism after time of substantial completion, or 4.) Insurrection or acts of aggression including war.

Related Damages and Losses: In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.

Consequential Damages: Except as otherwise indicated or required by governing regulation, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.

Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the following time period, starting on date of acceptance of replaced or restored work.

A period of time is equal to original warranty period of time.

Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor's obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.

Rejection of Warranties: Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of contract documents.

Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub subcontract for materials or units of work for materials or units of work for project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

Specific Warranty Forms: Where a special project warranty (guarantee) or specified project warranty is required, prepare a written document to contain terms and appropriate identification, ready for execution by required parties. Submit draft to Owner (through Architect/Engineer) for approval prior to final executions.

PART 2 PRODUCTS

GENERAL PRODUCT COMPLIANCES:

General: The compliance requirements, for individual products as indicated in contract documents, are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance

with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with. Also "allowances" and similar provisions of contract documents will have a bearing on selection process.

Procedures for Selecting Products: Contractor's options for selecting products are limited by contract document requirements, and governing regulations, and are not controlled by industry and governing regulations, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.

Required procedures include, but are not necessarily limited to, the following for various indicated methods of specifying:

Single Product/Manufacturer Name: Provide product indicated, except advice Architect/Engineer before proceeding, where known that named product is not a feasible or acceptable selection.

Two or More Product/Manufacturer Names: Provide one of the named products, at Contractor's option; but excluding products which do not comply with requirements. Do not provide or offer to provide an unnamed product, except where none of named products comply with requirements or are a feasible selection; advise Architect/Engineer before proceeding.

"Or Equal": Where named products in specifications text are accompanied by the term "or equal", or other language of similar effect, comply with those contract document provisions concerning "substitutions" for obtaining Architect/Engineer's approval (by change order) to provide an unnamed product. This product must meet or exceed the original specified product specifications.
"Named", except as otherwise indicated, is defined to mean manufacturer's name for product, as recorded in published product literature, of latest issue as of date of contract documents. Refer requests to use products of a later (or earlier) model to Architect/Engineer's for acceptance before proceeding.

Standards, Codes and Regulations: Where only compliance with an imposed standard, code or regulation is required, selection from among products which comply with requirements including those standards, codes and regulations, is Contractor's option.

Performance Requirements: Provide products which comply with specific performances indicated, and which are recommended by manufacturer (in published product literature or by individual certification) for application indicated. Overall performance of a product is implied where product is specified with only certain specific performance requirements.

Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements, using specified ingredients and components, and complying with specified requirements for mixing, fabricating, curing, finishing, testing and similar operations in manufacturing process.

SUBSTITUTIONS:
Conditions: Contractor's request for substitution will be received and considered when extensive revisions to contract documents are not required and changes are in keeping with general intent of contract documents; when timely, fully documented and properly submitted; and when one or more of following conditions is satisfied, all as judged by Architect/Engineer.

Otherwise, requests will be returned without action except to record non compliance with these requirements.

Where required product, material or method cannot be provided in a manner which is compatible with other materials of the work, or cannot be properly coordinated therewith, or cannot be warranted as required, or cannot be used without adversely affecting Owner's insurance coverage on completed work, or will encounter other substantial non compliance which are not possible to otherwise overcome except by making requested substitution, which Contractor thereby certifies to overcome such non compatibility, non coordination, non warranty, non insurability or other non compliance as claimed.

Work Related Submittals: Contractor's submittal of (and Architect/Engineer's acceptance of) shop drawings, product data or samples which relate to work not complying with requirements of contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

GENERAL PRODUCT REQUIREMENTS:

General: Provide products which comply with requirements, and which are undamaged and unused at time of installation, and which are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for intended use and effect.

Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar applications.

Nameplates: Except as otherwise indicated for required approval labels, and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of the work.

Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.

Equipment Nameplates: Provide permanent nameplate on each item of service connected or poser operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous.

PART 3 EXECUTION (not applicable)

END OF SECTION 016050

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.
7. Final As-Built survey

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
15. Attic stock or extra materials for the Owner are not to be used for punchlist or warranty work, unless permission is given. In such case, the material is to be restocked and provided to the Owner.
16. Final Topographical and Property Survey: Submit one paper and electronic copy of the site, including all new and existing structures, sealed by a licensed surveyor, including a digital copy in AutoCAD.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or

will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures".
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.5 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Electronic File of Project Record Documents: Provide Architect with an independent electronic archive of accepted project record documents using electronic project management software as defined in Division 01 Section "Project Management and Coordination.

C. Record Drawings: Maintain a set Contract Drawings and Shop Drawings for electronic project management software as defined in Division 01 Section "Project Management and Coordination".

1. Mark Record Drawings 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 prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets red-colored notations. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets and provide to the Architect for review and approval and, once approved, upload to the Owner’s cloud based document system. Include identification on cover sheets.

D. Record Specifications: Provide a copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders, Record Drawings, and Product Data, where applicable.

E. Record Product Data: Provide a copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

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 Drawings, and Record Specifications, where applicable.

F. Miscellaneous Record Submittals: Assemble and provide the Owner miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Upload to the Owner’s cloud based document system miscellaneous records and identify each, ready for continued use and reference.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.

b. System, subsystem, and equipment descriptions, including operating standards.
c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
d. Description of controls and sequence of operations.
e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.
b. Name, address, and telephone number of Installer or supplier.
c. Maintenance procedures.
d. Maintenance and service schedules for preventive and routine maintenance.
e. Maintenance record forms.
f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.
h. Copies of warranties and bonds.

B. Organize operation and maintenance files into suitable sets of manageable size. Upload documents to the Owner’s cloud based document system. Identify each file and cover document with the title specific to the discipline noting "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.7 WARRANTIES

A. Submittal Time: Provide copies of warranties on request of the Owner or Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Provide properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Upload warranties and bonds to the Owner’s cloud based document system.
2. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each file and document the typed title "WARRANTIES," Project name, and name of Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 REQUIRED DOCUMENTS TO BE PROVIDED TO UPLOADED TO THE OWNER’S CLOUD BASED DOCUMENT SYSTEM

- As-Built Drawings
- Close-Out Files

Additional Required Electronic Documents

- Punch Lists
- Special Tests
- Special Inspector Sign-Off
- Asbestos Affidavit
- Certificate of Occupancy
- Certificate(s) of Substantial Completion
- Owner Training / System Demonstrations (Sign-In sheet w/ hours)
- Change Orders
- As-Built Drawings
- Spare Parts / Attic Stock (Transmittal of delivery to Campus & IDEA sign-off)
- Subcontractor / Supplier Contact List
- Warranties
- Elevation Certificates
- Final Release of Liens
- Consent of Surety

3.2 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

3.3 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

C. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove tools, construction equipment, machinery, and surplus material from Project site.
5. Remove snow and ice to provide safe access to building.
6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
7. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
8. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
9. Sweep concrete floors broom clean in unoccupied spaces.
10. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
11. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials.
12. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
13. Remove labels that are not permanent.
14. Touch up and otherwise repair and restore marred, exposed finishes and surfaces.
15. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
16. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
17. Wipe surfaces of mechanical, electrical, elevator, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
18. Replace parts subject to unusual operating conditions.
19. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
20. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
21. Clean ducts, blowers, and coils if units were operated without filters during construction.
22. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
23. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
24. Leave Project clean and ready for occupancy.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.4 ATTIC STOCK ITEMS

A. Provide the following items to Owner at the end of the project as Attic Stock. Prior to delivery of items, coordinate location with Owner for storage of items. Maintain log or transmittal letters identifying provided items and record of person receiving them on behalf of the Owner.

SECTION 09300 TILE

Ceramic Tile	(2) Cartons – 6x24 Floor Tile
	(2) Cartons – 4x12 Wall Tile

SECTION 09510 ACOUSTICAL CEILINGS

Acoustical Ceiling	(2) Boxes – Type I
	(2) Boxes – Type II
	(2) Box – Type III
	(2) Box - Type IV
	(2) Box – Cloud 1

SECTION 09650 RESILIENT FLOORING

Vinyl Composition Tile:	(3) Boxes – Field Color
	(1) Box- Each Accent Color
Rubber Base:	60 LF

SECTION 09813 TILE CARPETING

Carpet Tile:	(2) Boxes – Each selected color

SECTION 09900 PAINTING

Paint:	(3) 5-gallon - Field Color
	(1) 5-gallon – Each Accent Color

SECTION 10260 CLEAR CORNER GUARDS

Corner Guards	(10) with anchors

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

SECTION 224713 - DRINKING FOUNTAINS

Filter Cartridges: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 3 of each.

SECTION 233300 - AIR DUCT ACCESSORIES

Fusible Links: Furnish quantity equal to 10 percent of amount installed.

SECTION 233423 Power HVAC Ventilators

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

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.

SECTION 237433 - DEDICATED OUTDOOR-AIR UNITS

Furnish extra materials 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-driven fan.
2. Filters: One set for each unit.

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

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.

SECTION 230900 – INSTRUMENTATION AND CONTROLS

Adjustable Limited Range Wall Temperature Sensors (Thermostats): Provide extra thermostats: 5 of each type.

SECTION 262416 - PANELBOARDS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Provide five (five).
2. Circuit Breakers Including GFCI and GFEP Types: Two of each type.
3. Fuses for Fused Switches: Three of each type.

SECTION 262726 - WIRING DEVICES

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Service/Power Poles: One of each type
2. Floor Service-Outlet Assemblies: One of each type
3. Poke-Through, Fire-Rated Closure Plugs: One of each type

SECTION 262813 – FUSES

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Three of each type.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Three of each type.
2. Fuse Pullers: Two for each size and type.

SECTION 262913 - ENCLOSED CONTROLLERS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
5. Indicating Lights: Two of each type and color installed.
6. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
7. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

SECTION 265116 - INTERIOR LIGHTING

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Light Fixtures: Lamps: Three of each type.
2. Diffusers and Lenses: Five of each type.
3. LED-luminaire-mounted emergency battery pack: Five of each type.
4. Globes and Guards: Three of each type.

SECTION 265219 - EMERGENCY AND EXIT LIGHTING

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Light Fixtures: Two of each type.
2. LED-luminaire-mounted emergency battery pack: Five of each type.
3. Diffusers and Lenses: Two of each type.
4. Globes and Guards: Two of each type.

B.

SECTION 265621 - EXTERIOR LIGHTING

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Light fixtures: One of each type, no poles required.
2. Diffusers and Lenses: Two of each type.
3. Globes and Guards: Two of each type.

SECTION 267210 - FIRE ALARM SYSTEM

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. Fire Alarm Initiating Devices: Three of each type.
2. Fire Alarm Indicating Devices: Three of each type.

SECTION 267240 - INTRUSION DETECTION

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. Intrusion Detection Devices: Three of each type.

SECTION 2679750 – VOICE AND DATA COMMUNICATION CABLING EQUIPMENT

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. UTP Patch Cords: For each data connector, provide four-pair cables in ten-foot lengths, terminated with RJ-45 plug at each end. Use keyed plugs for data service.

    a. IT closet-quantity: 15% of installed Data/Phone ports on patch panels
    b. Work area - quantity: 15% of installed Phone/Data/VoIP phone jacks in offices.
    c. PoE Cameras - quantity: 15% of installed Poe Camera locations.
    d. Wireless Access Points- 15% of installed Poe Wap locations.

END OF SECTION

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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 02060 - DEMOLITION

PART 1 - GENERAL:

SUBMITTALS:
The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for approval. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

GENERAL REQUIREMENTS:
The work includes demolition or removal of all construction indicated or specified. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the limits of the property. Rubbish and debris shall be removed from the property daily unless otherwise directed so as to not allow accumulation inside or outside the building. Materials that cannot be removed daily shall be stored in areas specified by the Architect.

DUST CONTROL:
The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create hazardous or objectionable conditions such as ice, flooding and pollution.

PROTECTION:
1. Protection of Existing Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent tot the work. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the owner, and any damage to such work shall be repaired or replaced as approved by the Architect at no additional cost to the owner. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required. The Contractor shall insure that structural elements are not overloaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this contract.

2. Protection of building from the Weather: The interior of the building and all materials and equipment shall be protected form the weather at all times.

3. Protection of Trees: Trees within the project site which might be damaged during demolition, and which is indicated to be left in place shall be protected by a 6-foot high fence. The fence shall be securely erected a minimum of 5-feet from the trunk of individual trees of follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced.
4. Environmental protection: All work and Contractor operations shall comply with the requirements of SECTION: ENVIRONMENTAL PROTECTION.

BURNING: The use of burning at the project site of the disposal of refuse and debris will not be permitted.

USE OF EXPLOSIVES: Use of explosives will not be permitted.

PART 2 - EXECUTION:

EXISTING FACILITIES:

1. Structural, Walls, and Partitions: Existing walls and partitions indicated shall remain.

DISPOSITION OF MATERIAL:

1. Title of Materials: Title to all materials and equipment to be demolished, excepting owners salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The owner will not be responsible for the condition, loss or damage to such property after notice to proceed.

2. Material for Contractor Salvage: Material for salvage shall be stored as approved by the Architect. Salvage materials shall be removed form Owner's property before completion of the Contract. Material for salvage shall not be sold on the site.

CLEAN UP:

1. Debris and Rubbish: Debris created by the demolition of existing roofs shall be removed form site and buildings.

2. Debris Control: Debris shall be removed and transported in a manner as to prevent spillage on streets or adjacent areas.

3. Regulations: Local regulations regarding hauling and disposal apply.

END OF SECTION 02060

SECTION 022810 - TERMITE CONTROL

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Provide soil treatment for termite control, as herein specified.

QUALITY ASSURANCE:

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

JOB CONDITIONS:

Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil treatment manufacturer.

SUBMITTALS:

Product Data: Submit manufacturer's technical data and application instructions.

SPECIFIC PRODUCT WARRANTY:

Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re -treat soil and repair or replace damage caused by termite infestation.

Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

PART 2 - PRODUCTS

SOIL TREATMENT SOLUTION:

Use an emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a dilutant. Provide a solution consisting of one of the following chemical elements and concentrations:

Chloropyrifos (Dursban TC); 1.0% in water emulsion.

Permathrin (Dragnet, Torpedo); 0.5% in water emulsion.

Cypermethrin (Prevail FT); 0.25% in water emulsion.

PART 3 - EXECUTION

APPLICATION:

Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicant may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

Application Rates: Apply soil treatment solution as follows:

Under slab on grade structures, treat soil before concrete slabs are placed using either power sprayer or tank -type garden sprayer.

Apply 4 gallons of chemical solution per 10 lineal feet to soil critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, and around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

Apply one gallon of chemical solution per 10 square feet as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1 -1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

Elsewhere: Apply uniformly under sidewalks and all other paved areas within five feet of building, at rate of one gallon per ten square feet.

At expansion joints, control joints, and areas where slabs will be penetrated, at rate of 4 gallons per 10 lineal feet of penetration.

Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION 022810

SECTION 024440 VINYL COATED CHAIN LINK FENCES AND GATES

PART 1 GENERAL

RELATED DOCUMENTS
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

DESCRIPTION OF WORK:
Extent of vinyl coated chain link fences and gates is shown on drawings.

QUALITY ASSURANCE

Provide chain link fences and gates as complete units controlled by a single source including necessary erection accessories, fittings, and fastenings.

SUBMITTALS

Submit Product data in the form of manufacturer's technical data, specifications, and installation instructions for metal fencing and gates.

PART 2 PRODUCT

GENERAL

Exterior Chain Link Fence 6ft High Green Vinyl, and Green Vinyl Posts

Dimensions shown form pipe, roll formed, and H sections are outside dimensions.

MANUFACTURERS

Vinyl Coated Steel Fencing and Fabric:
Allied Tube and Conduit Corp.
Anchor Fence, Inc.
Colorguard Corp.
Davis Walker Corp.
Dominion Fence and Wire Prod.
United States Steel.
Merchants Metals

STEEL FENCING (STFN):
Fabric: No. 9 ga. (0.148") core finished steel wires, 2" mesh, with top selvages knuckled for fabric 60" high and under, and both top and bottom selvages twisted and barbed for fabric over 60" high. Furnish one-piece fabric widths for fencing up to 12' high.

Fabric coating: The zinc coating of the fabric shall be minimum .30 oz./sq. ft. of uncoated wire surface. The weight of zinc coating on the fabric shall be determined in accordance with ASTM A-90.

PVC: Wire shall be coated with a minimum of 8 gauge finish of poly-vinyl chloride permanently bonded to the galvanized wire by the thermal fusion bonded method. Chain link fabric shall conform to the requirements of ASTM F-668, class 2b.

HARDWARE AND ACCESSORIES:

Framework: Galvanized steel, ASTM A 120 or A 123, with not less than 2.0 oz. zinc per sq. ft. of surface. All framework and components shall be coated with 10 to 15 mils of PVC.

End, Corner, and Pull Posts: Minimum sizes and weights as follows:

Up to 6 feet fabric height: 2.375 inch OD steel pipe, 3.65 lbs. per lin. ft., or 3.5 inch by 3.5 inch roll formed sections weighing 4.85 lb. per lin. ft.

Over 6 feet fabric height: 2.875 inch OD steel pipe, 5.79 lbs. per lin. ft., or 3.5 inch by 3.5 inch roll formed sections weighing 4.85 lbs. per lin. ft.

Line posts Space 10' o.c. maximum, unless othewise indicated, of following minimum sizes and weights.

Up to 6 feet fabric height: 1.90 inch OD steel pipe, 2.70 lbs. per lin. ft. or 1.875" x 1.625" C sections, 228 lbs. per lin. ft.

6' to 8' fabric height, 2.375" OD steel pipe, 3.65 lbs. per lin. ft. or 2.25" x 1.875" H sections, 2.64 lbs. per lin. ft.

Over 8 feet fabric height: 2.875 inch OD steel pipe, 5.79 lbs. per lin. ft. or 2.25" x 1.875" H sections, 3.26 lbs. per lin. ft.

Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

Leaf Width	Gate Post	Lbs./Lin. Ft.
Up to 6’	3.5" x 3.5" roll formed	4.85
	section or 2.875" OD pipe	5.79
Over 6' to 13'	4.000" OD pipe	9.11
Over 13' to 18'	6.625" OD pipe	18.97
Over 18'	8.625" OD pipe	28.55

Tension Wire: 7 gage, coated coil spring wire, metal finish to match fabric. Locate wire at bottom of fabric.

Top Rail: Provide 1 -5/8" diameter galvanized steel.

Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375"diameter rod and adjustable tightener.

Post Tops: Weathertight closure cap for tubular posts. Provide one cap for each post.

Stretcher Bars: One piece lengths equal to full height of fabric, with minimum cross section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

Corner Bracing: Install diagonal cross bracing consisting of 3/8" diameter adjustable length truss rods on corner posts to ensure frame rigidity without sag or twist, if required.

Stretcher Bar Bands: Space not over 15" oc., to secure stretcher bars to end, corner, pull and gate posts.

GATES

Fabrication: Fabricate gate perimeter frames of 1.90" OD pipe.
Metal and finish to match fence framework. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame member's maximum of 8 feet apart.

Assemble gate frames by welding or with special fittings and rivets, for rigid connections. Use same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to gate frame at not more than 15" o.c. Attach hardware to provide security against removal or breakage.

Install diagonal cross bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist, if required.

Gate Hardware: Furnish the following hardware and accessories for each gate.

Hinges: Size and material to suite gate size, non lift off type, offset to permit 180 deg gate opening. Provide 1 1/2 pair of hinges for each leaf over 6 foot nominal height.

Latch: Forked type or plunger bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

Sliding Gates: Provide manufacturer's standard heavy duty track, ball bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.

Wire Ties: For tying fabric to line posts, use wire ties spaced 12" o.c. For typing fabric to rails and braces, use wire ties spaced 24" o.c. For tying fabric to tension wire, use hog rings spaced 24" o.c.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

Concrete: Provide concrete consisting of Portland cement, ASTM C150, aggregates, ASTM C33, and clean water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 EXECUTION

INSTALLATION

Do not begin installation and erection before final grading is completed, unless otherwise

permitted.

Excavation: Drill holes for posts to diameters and spacings shown, in firm, undisturbed or compacted soil.

If not shown on drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer.

Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

Setting Posts: Center and align posts in holes 3 inches above bottom of excavation.

Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

Center Rails: Provide center rails where shown. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

Tension Wire: Install tension wires before stretching fabric and tie to each post with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 gage galvanized steel hog rings of spaced 24 inches o.c.

Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

Stretcher Bars: Thread through or clamp to fabric 4 inches o.c., and secure to posts with metal bands spaced 15 inches o.c.

Gates: Install gates plumb, level, and secure for full opening without interference. Install ground set items in concrete for anchorage as recommended by manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

Tie Wires: Use U shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend wire to minimize hazard to persons or clothing.

Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION 02444

SECTION 02810 – IRRIGATION

PART 1 – GENERAL

1.01 SCOPE

A. An automatic underground irrigation system for exterior landscaped areas including, but not limited to, supply an installation of water meter, backflow device and controller, boring and sleeving, rotary heads and spray heads in lawn areas and spray heads and drip lines in shrub, ground cover, and flower bed areas.

NOTE: This project is an existing campus with existing irrigation, lawns and landscape. Contractors shall protect or demo as shown all existing irrigation, lawns, landscape, etc. Any damage whatsoever to existing irrigation, landscape or lawns labeled to remain or to be protected shall be repaired and replaced at contractor's expense. All existing landscape shall be maintained throughout construction and until final acceptance by Owner / GMS / SSP.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Provide connection to water source (existing mainline) and new water meters as specified and in accordance with local code requirements.
   2. Provide for an electro-mechanical controller.

B. Performance Requirements: Provide for irrigation at a rate of 1 in. per week applied at 2 or 3 day intervals.

1.03 QUALIFICATIONS

A. Irrigation work to be performed by a Texas licensed irrigation company specializing in commercial irrigation installation with a minimum of five (5) years experience on similar projects. Owner/SSP Design to review qualifications and approve subcontractor prior to commencing work.

1.03 SCHEDULE OF VALUES

A. Landscape/Irrigation subcontractor shall submit costs for GC schedule of values as follows:.

   1. Irrigation Sleeving
   2. Irrigation Water Meter, Backflow, Permits, Testing
   3. Irrigation System
   4. Landscape Athletic Field Grading and Soil Mix
   5. Landscape Athletic Field Sod
   6. Landscape Planting, Materials, Installation, Warranty
   7. Landscape / Irrigation 90 Day Maintenance

1.04 SUBMITTALS

A. Submittals shall be formatted electronically in a PDF file with a table of contents and tabs identifying each section. The following submittals are required for this section:
   1. Product Data: Manufacturers' technical data (Cut Sheets) and installation

information for all components including: Backflow Assembly (Pressure Vacuum Breaker PVB or Reduced Pressure, Backflow Preventer RPZ (as specified), Y strainer (if required), Ball valves, PVC pipe, PVC fittings, PVC primers, solvents, cement, glue, etc., Control wire / tracking wire, Wire connectors, Pump stations, booster pumps (if specified), Pump enclosures (if specified), Controller (incl. communications modules, etc.), Rain/freeze sensors, Valves, Valve boxes, Decoders (if specified), Rotors, Sprays, Nozzles, Bubblers, Drip line, Drip filters, Drip indicators (Operind), Air relief valves, flow sensor.

1.05 QUALITY CONTROL

A. Submit verification of water pressure at meter or point of connection.

1.06 MAINTENANCE/WARRANTY

A. Provide the following extra materials to the Owner:
   1. Two (2) quick coupler hose bib keys.
   2. Four (4) keys for the controller door lock.

B. Maintenance Requirements: Maintain the work of this Section for ninety days after 'substantial completion' and until final acceptance by Owner. Notify the owner in writing of 'substantial completion'. Maintenance period begins after owner's acceptance of 'substantial completion'.

C. Maintenance Service: Perform the following maintenance operations at least once a week during construction and for 90 day maintenance period after substantial completion:
   1. Test entire system and adjust timer as necessary and as directed by landscape contractor, landscape designer or owner.
   2. Ensure and confirm existing irrigation system is operational and functioning properly. Existing irrigation system must remain fully functional and operational during the construction period and for 90 days after substantial completion.
   3. Replace or repair any broken parts or equipment.
   4. Report any significant problems in writing to landscape contractor, owner and landscape designer.

D. Warranty: Warranty shall cover all parts and equipment for a period of one year from the date of final acceptance. Repairs and replacements shall be completed within two weeks of notification from owner.

PART 2- PRODUCTS

2.1 MATERIALS

A. PVC Plastic Pipe: ASTM D 2241-83, SDR21, class 160 lateral piping; ASTM D1785, class 200 mainline piping.

B. Pipe Fittings:
   1. Pipe under 3 in., id: Socket type, ASTM D 2466-78, with solvent Cement, ASTM D 2564-80.
   2. Pipe 3 in. id and Larger: Gasketed fittings of epoxy coated steel with non-hardening pipe dope or Teflon tape for threads.

C. Concrete: 2500 psi min. compressive strength.

2.2 MANUFACTURED UNITS

A. Controller: Electro-mechanical, 24 hr./14-day clock with manual operation capacity, with adequate number of stations for system operating requirements (two wire) (see irrigation equipment table). Provide both freeze-protection and rain-sensor devices with controller. Provide ground-fault interrupt and lightning protection. Provide flow sensor, flow control, and IQ System and software. Contractor to coordinate setup and connection to IQ software including training.

B. Water Meters: Water meters in locations shown on plans. Contractor to coordinate application, permit and installation with local utility company. Contractor responsible for water meters and all associated installation costs.

C. Booster Pump: If required on plans, contractor shall furnish and install booster pump with enclosure as specified in plans/details. Contractor shall also provide a concrete pad and any and all fittings, adaptors, connections, enclosure, etc. for the complete installation and proper operation of booster pump. If booster pump is existing, contractor must ensure and confirm new system is programmed and functioning properly.

D. Backflow Preventers: Provide and install backflow devices per local codes, specifications and requirements. Provide steel mesh enclosure per plans/schedule.

E. Electric Valves: Normally closed, 24v AC, 60 cycle, solenoid actuated, globe pattern, diaphragm type. Cast brass or plastic body and nylon reinforced nitrile rubber diaphragm.

F. Flow Sensor: Flow sensor size as specified on plans. Coordinate with IQ setup and learned flow for controller scheduling.

G. Quick coupling Valves: Cast brass body with self-closing cover. Provide (2) brass keys with 1 in. female threaded outlet.

H. Sprinkler Heads: Heavy-duty plastic sprinkler case, high density plastic sprinkler body, corrosion-resistant internal parts, plastic spray nozzles with adjustable flow and direction features.

I. Control Wire: 24v UL/UF., approved for direct burial. Provide color-coded wire with white used for common (14-gauge, single-strand copper) and red for control (14-gauge single-strand copper).

J. Tracking Wire: 18 gauge copper (only where mainline and wiring bundle are separated)

K. Valve Boxes: Heavy-duty commercial grade, fiberglass reinforced, plastic with locking

covers. Rainbird VB series, 10” Round or Standard Rectangular Min. or apprvd equal.

L. Swing Joints: 3 high density polyethylene street ells with 8 in. Schedule 80 PVC nipple; sized the same as inlet to sprinkler head.

M. Sleeves: Schedule 40 PVC. Boring as required under all existing pavement, walls or curbs.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the site and conditions under which irrigation work is to be performed. Irrigation contractor shall notify the landscape contractor in writing, with a copy to Construction Manager, if the site is unsatisfactory. Do not begin the work until unsatisfactory conditions have been corrected in a manner acceptable to irrigation contractor. Beginning of work indicates acceptance of the site as satisfactory by the irrigation contractor.

3.02 INSTALLATION

A. General: Install tracking wire along mainline pipe if separate from valve wiring bundle.

B. Excavating and Filling:
1. Cover for Piping:
    a) Mains: 18 in. min.
    b) Laterals: 12 in. min.
2. Use clean backfill material without stones larger than 1/2 in., debris or extraneous material that may damage pipe assembly.
3. Compact all trenches to a minimum 95% Standard Proctor Density.

C. Pipe:
1. Install in existing sleeves under pavement or provide boring and sleeves under pavement as required.
2. Clean pipe and joints before making connections. Purple primer to be used on all joints before applying solvent. Per TCEQ Regulations.
3. Attach joints according to manufacturer's instructions. Threaded joints to be coated with "Teflon" tape. Allow joints to set for at least 24 hrs. before applying water pressure to the system.
4. Thoroughly flush piping before sprinkler heads are installed and test under pressure for leaks in each line separated by valves.

D. Water Meters: Provide and install water meters per local codes, specifications and requirements. Coordinate permit and application with owner and local utility company. Adjust locations as necessary to coordinate with existing water line locations.

E. Back Flow Protection: Provide and install backflow devices per local codes, specifications and requirements including enclosure.

F. Valves:
1. Provide isolation valve on inlet side of every electric control valve (if specified).

2. Install electric and gate valves with at least 10 in. of cover over the valve and at least 6 in. of cover over the stem.
3. Install valve box centered over the flow control handle. Provide 1 cu. ft. of clean pea gravel in the bottom of each valve box with filter fabric below.
4. In lawn areas, valve boxes to be set flush with existing grade; in planting bed areas valve boxes shall be set 2” above grade.

G. Controllers: Hard wire to nearest power source and CAT6 data line/ethernet or cellular module as specified on plans. Coordinate with general contractor. Install on exterior wall in location as shown on plans or as directed/approved by SSP.

H. Sprinkler Heads: Install all heads on swing joint assemblies and flush with finish grade.

I. Drip Line: Install dripline as specified in plans/details. All drip lines, fittings, etc. to be buried a minimum of 2” below finish grade and then covered additionally with mulch per depth on plans/details. All dripline to be pinned with galvanized drip pins no more than 36” spacing and at all fittings and joint locations.

J. Wiring:
1. Bundle and tape wires at 10 ft. o.c., max.
2. Snake wire in trenches to allow for expansion. Provide expansion coils at 100 ft. o.c. max., and at the entry to each valve box.
3. Splice wires using mechanical sealant connector for a waterproof connection. Make all wire splices within valve boxes. Use RB WPCONN N90300 or approved equal.

3.03 FIELD QUALITY WORK

A. General: Notify the Construction Manager at least 48 hours before testing is begun.
B. Hydrostatic Test: Test mainline piping to a hydrostatic pressure of not less than 100 psi for a minimum of 24 hours. Piping may be tested in sections to expedite work. Remove and repair piping and connections which do not pass hydrostatic testing.
C. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinkler heads adjusted to final position.

3.04 ADJUSTING

A. Check sprinkler heads for arc of spray. Adjust as necessary to provide 100% coverage of all landscaped areas.
B. Adjust layout to conform to actual layout of landscape plantings.

3.05 DEMONSTRATION

A. Demonstrate operation of the system to Owner's personnel and staff.

3.06 CLOSE-OUT DOCUMENTS

A. As-Built Drawings: Submit ‘As-Built’ drawings before project close-out showing the irrigation system layout, including line locations and sizes, spray heads and types, points of connection, booster pump, location of backflow device(s), controller, and other installation

information.

B. Warranty Letters: Submit warranty letters for all irrigation items including labor for the specified warranty period.
C. Operation and Maintenance Data: Submit Manufacturers' operation and maintenance instructions and laminated colored (11x17) valve Zoning Diagram.

END OF SECTION

SECTION 02900 – PLANTING

PART 1 - GENERAL

1.01 SCOPE

A. Supply and installation of all approved materials, labor, equipment, transportation and services required and incidental thereto, in conformity with the plans and specifications, including but not limited to; vegetation protection/pruning, fine grading, earth mounding, bed excavation and preparation, bed edging, planting soil/compost mixes, fertilizer, mulch, trees, palms, shrubs, ground covers, staking, paving, site furniture, clean-up, maintenance, and warranty.

B. Related Sections:
   1. Irrigation – 02810
   2. Lawns – 02930

NOTE: This project is an existing campus with existing irrigation, lawns and landscape. Contractors shall protect or demo as shown all existing irrigation, lawns, landscape, etc. Any damage whatsoever to existing irrigation, landscape or lawns labeled to remain or to be protected shall be repaired and replaced at contractor's expense. All existing landscape shall be maintained throughout construction and until final acceptance by Owner / GMS / SSP.

1.02 REFERENCE STANDARDS

A. General: "Hortus Third," 1976.

B. Texas Association of Nurserymen, Grades and Standards for Nursery Stock.

C. Plant Material: "American Standard for Nursery Stock," ANSI Z60.1-1990.

D. National Arborist Association Standards

1.03 DEFINITIONS

A. Specimen Plants: Plants having exceptional character, superiority in form and branching, and the best attributes of the species; all as determined by the Architect, Landscape Designer or Owner.

1.04 QUALIFICATIONS

A. Landscape work to be performed by a single firm specializing in commercial landscape work with a minimum of five (5) years experience on similar type projects. Owner/SSP Design to review qualifications and approve subcontractor prior to commencing work.

1.03 SCHEDULE OF VALUES

A. Landscape subcontractor shall submit costs for GC schedule of values as follows:.

   1. Irrigation Sleeving
   2. Irrigation Water Meter, Backflow, Permits, Testing
   3. Irrigation System

4. Landscape Athletic Field Grading and Soil Mix
5. Landscape Athletic Field Sod
6. Landscape Planting, Materials, Installation, Warranty
7. Landscape / Irrigation 90 Day Maintenance

1.04 SUBMITTALS

A. Submittals shall be formatted electronically in a pdf file with a table of contents and tabs identifying each section. The following submittals are required for this section:
   1. Landscape Construction Sequence
   2. Edging Materials
   3. Post emergent Herbicides
   4. Pre emergent Herbicides
   5. Soils, Compost and Mulch
   6. Sources of all Plant Materials (including address and telephone numbers)
   7. Product Data Material Safety Data Sheets
   8. Paving Materials
   9. Staking Materials
   10. Samples: One foot sections of edging (as specified on plans), one pound bag sample of each; topsoil, premium compost, mulch, decomposed granite, river rock, washed gravel and example boulder/rocks.
   11. Photographs of all plant material prior to ordering/installation
   12. Name and License Number of Subcontractor for pruning trees (Certified I.S.A. Arborist required)

1.05 PROTECTION

A. Before commencing work, contractor shall place orange construction fencing around all vegetation labeled “to remain” on landscape plans. Fencing shall be placed squarely around each tree 6’ x 6’ and at least 60” in height or continuously around groups of vegetation as shown on plans. No work may begin until this requirement is fulfilled. All other vegetation not labeled “to remain” shall be cleared and grubbed including root systems.

B. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.

C. The contractor shall use any and all precautionary measure when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.

D. The Contractor shall adjust depth of earthwork and loaming when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.

E. Where excavating, fill or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:

   a. TRENCHING: When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without

injury to the roots.

b. RAISING GRADES: When the existing grade at tree is below the now finished grade, and fill not exceeding 16 inches (16") is required, clean, washed gravel graded from one to two inches (1" - 2") in size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18 inches (18") and finish approximately two inches (2") above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill. Where fill exceeding 16 inches (16") is required, a dry laid tree well shall be constructed around the trunk of the tree. The tree well shall extend out from the trunk on all sides a minimum of three feet (3') and to three inches (3") above finish grade. Coarse grade rock shall be placed directly around the tree well extending out the drip line of the tree. Clean, washed gravel graded from one to two inches (1" - 2") in size shall be placed directly over the coarse rock to a depth of three inches (3"). Approved backfill material shall be placed directly over the washed gravel to desired finished grade.

c. LOWERING GRADES: Existing trees in areas where the now finished grade is to be lowered shall have regarding work done by hand to elevation as indicated. Roots as required shall be cut cleanly three inches (3") below finished grade and scars covered with tree paint.

d. Trees marked for preservation that are located more than six inches (6") above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Trees located more than 16 inches (16") above proposed grades shall have a dry laid stonewall, or other retaining structure as detailed on the plans, constructed a minimum of five feet (5') from the trunk. Exposed or broken roots shall be cut clean and covered with topsoil.

F. Contractor is responsible for all protection measures listed above. If these procedures are not followed, contractor is responsible for replacement of existing trees with approved trees of equal caliper and height.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Transport plant materials covered or in closed vehicles to protect from exposure to heat and wind. Spray trees and in full leaf with anti-desiccant - as recommended by the manufacturer - before shipping. Take precautions to protect plant materials from desiccation and from damage to bark, branches and roots. Do not allow root balls to crack. Schedule shipments to coincide with planting work schedule.

B. Storage and Protection: If planting is delayed after delivery, keep plants in a shaded area, cover roots with mulch or topsoil, and keep plants constantly watered until planted.

1.07 MAINTENANCE/WARRANTY

A. Maintenance Requirements: Maintain the work of this Section throughout construction and for ninety days after ‘substantial completion’ and until final written acceptance by Owner. Notify the owner in writing of ‘substantial completion’. Maintenance period begins after owner’s written acceptance of ‘substantial completion’.

B. Maintenance Service: Perform the following maintenance operations at least once a week:

1. Remove and replace dead plant material. Prune plants to remove dead wood and to maintain health of plants.
2. Maintain all mulched areas at a 2 in. depth. Remove weeds and grass from shrub and ground cover areas and from watering basins.
3. Provide insect and disease control to maintain health of plants.
4. Irrigation:
   a) If the irrigation system is operating, program and monitor the system to provide adequate water for plants.
   b) If the irrigation system is not operating, hand water plants. Deep water trees each week.
5. Dispose of all maintenance debris/clippings off-site. Owner's dumpsters shall not be used.
6. Keep all site areas tidy and free of grass clippings, mulch or other foreign materials.
7. Submit dates, descriptions and receipts of all maintenance operations to SSP Design for approval.

C. Warranty: Warranty shall cover all shrubs/groundcovers for a period of three months and trees/palms for a period of one year from the date of final acceptance. Any plant material deemed dead or unrecoverable by the owner shall be replaced with similar species and size within two weeks of notification from owner.

1.08 RIGHT OF REJECTION

A. The Owner/SSP Design reserve the right to inspect and reject plants at any time and at any place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fertilizer: 13-13-13 Osmocote slow release fertilizer granules or approved equal.

B. Planting tablets: Agraform 21 gram slow release fertilizer tablets or approved equal.

C. Compost: Premium grade compost ('9 Kids Compost' or approved equal).

D. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0; organic matter to exceed 1.5%, magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/GC in soil.

E. Sand: Clean, screened inorganic masonry sand. Silica sand only. River sand not acceptable. Mathis sand, Wright Materials, Plant 3 masonry sand (361) 387-0293 or approved equal

F. Mulch:
   1. Shrub and Ground Cover Planting Areas: Grade A Shredded Hardwood; long, fibrous bark strands free from wood chips. Texas Natives or Approved Equal.
   2. Watering basins: Grade A Shredded Hardwood; long, fibrous bark strands free from wood chips. Texas Natives or Approved Equal.

G. Plants:
1. General: Provide plant materials that are healthy and free from disease, insects, and larvae and without damage to bark, branches, and roots.
2. Approval: All plants must be approved by Owner/SSP Design prior to installation. Any plants not approved by Owner/SSP Design shall be subject to rejection. All trees/palms must be inspected, approved and tagged by Owner/SSP Design at their place of origin or as directed in writing by Owner/SSP Design. Container grown trees shall be obtained by Glen Flora Farms, Inc. or approved equal.
3. Sizes: Measured after pruning and in accordance with the plant schedule.
4. Root Treatment: As follows in accordance with the Reference Standards:
    a) Palms: Balled and burlapped or containerized if they have been in the container for at least one growing season.
    b) Trees, Shrubs, Ground Cover Plants: Container grown with a well-established fibrous root system.
5. Palms: All new palms shall be field dug or containerized material in specified sizes shown in plant schedule. All palms shall have good form (straight trunks) consistent of its species, free of scares/abrasions/burn marks and disease and insects, with large healthy root systems. Rootballs sizes for B/B material must meet the following minimum specifications:
    a) Sabal Palms - 44” diameter, 36” height
    b) Washingtonia Palms - 44” diameter, 36” height
    c) Cuban Royal Palms, Mediterranean Fan Palms, Cocos Palms - 30” diameter, 30” height

H. Staking material:
1. Tree stakes shall be commercial grade T-Posts, 1.25 Gauge, 8’ Ht., Green with orange safety caps on tops. Note: Do not drive through stakes through root balls.
2. Tree ties shall be Poly Chain Lock – 1” width, black, ProLock or approved equal
3. Palm stakes shall be treated timber braces, stakes, and battens including burlap protection and steel straps sized per palm planting detail. Ground stakes must be at least 48” in length with at least 42” securely embedded in undisturbed soil.
4. All staking to be removed at the end of the maintenance period or at final acceptance, whichever is later.

I. Edging:
1. Concrete Edging: Extruded, colored, fibermesh reinforced concrete edging (per details) *Curb Appeal (or approved equal)*
2. Tree Rings: 4” Ht., 30” Dia., Black Anodized Aluminum tree rings. *Dreamscapes (or approved equal)*
3. Aluminum edging: 4” Ht., Black Anodized Aluminum Edging. *Dreamscapes (or approved equal)*

2.2 PLANTING SOILS

A. Planting Mix: 75 percent sandy-loam topsoil; 25 percent premium compost; (3:1 ratio by volume); and specified fertilizer or planting tablets.

B. Shrub and Ground Cover Areas:
1. Where no topsoil has been installed: Remove twelve inches of existing soil and replace with ten inches of ‘Planting Mix’ as described in Item A above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine the site and conditions under which landscape work is to be performed. Have the installer notify the Contractor in writing, with a copy to SSP Design if the site is unsatisfactory. Do not begin the work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Beginning of work indicates acceptance of the site as satisfactory by the installer.

3.02 EXECUTION

A. Site Preparation: Contractors must visit and review site prior to bidding. Compacted soils and sub-soils from construction activities must be ripped and tilled until a loose, friable and free-draining condition is met. All existing weeds, grass, stabilized sub-base material, rubble, excavated soil and other material shall be removed from the site and disposed of by the contractor prior to starting any new landscape work. Soil conditions around entire site must be approved by Owner/SSP Design prior to rough and finished grading operations. Contractor shall not install any fill or topsoil in landscape areas prior to site condition approval by Owner/SSP Design.

B. Drainage: Landscape contractor shall follow grading as shown and specified on Civil Engineer's grading plans. Landscape contractor shall coordinate grading operations with site contractor. Landscape contractor shall ensure final grades conform to the Civil Engineer's grading plan including grades around building, swales, sidewalk under-drains/swales, roof drains, splash blocks and rock swales through planting beds.

C. Vegetation Protection: Contractors are responsible for protection of existing vegetation labeled on plans "to remain". Protection of existing vegetation includes supply and installation of protective fencing around all existing planting areas.

D. Bed Preparation and herbicide: All planting areas shall be free of weeds, grass, insects, or any other deleterious material prior to bed preparation. Contractor shall herbicide all planting areas with 'RoundUp' or approved equal at least two times prior to installation of any new plants. Pre-emergent herbicide shall be applied after planting and before placement of mulch.

E. Planting Beds: Excavate 12" of existing soil within planting beds and replace with 8" of imported topsoil and 2" of premium compost. Mechanically till into top six inches of bed until a loose, friable soil condition is met. Final grades within all planting beds shall be 3" below building weep holes and adjacent curbs to allow for 2" layer of mulch. Contractor to ensure positive drainage throughout all landscape areas. Adjust grades as necessary to direct water away from buildings, structures and planting beds. Report any discrepancies on all drainage issues in writing to Construction Manager or the Civil Engineer. Owner or SSP Design to approve planting beds prior to planting operations.

F. Edging: Edging shall be installed as shown on plans. Edging shall allow for tapered drainage points (10 feet on center or less) to ensure free drainage away from all structures and walkways. Edging shall be set flush with adjacent paving, sidewalks or driveways.

G. Grass Areas: Scarify, float and fine grade all areas to receive sod or hydromulch for approval by SSP prior to placement of sod or application of hydromulch. Supply additional topsoil as necessary to fill any/all low areas and ensure positive drainage away building / planting beds. (see specification on lawns for further requirements).

H. Berms and Mounding: Supply topsoil and construct berms as indicated on plans. Berms shall have a maximum slope of 1:4. Owner or Construction manager to approve berming and mounding prior to planting operations.

I. Planting:

1. Installation:
    a) Excavate planting pit and french drains to depth and width indicated on details in drawings.
    b) Set root ball on undisturbed or compacted soil in planting pit. Remove burlap, rope, wire, and all other wrapping material from top of ball. Remove any binding rope which is not biodegradable completely. Top of root ball shall be set 1" above adjacent finished grade.
    c) Fill planting pit 2/3 full with planting mix, soak with water and allow settling, and adding fertilizer tablets as detailed. Finish filling pit with planting mix and tamp lightly.
    d) Construct a watering basin as detailed (or install aluminum edge tree ring) and install 2 in. layer of mulch. Water-in to completely saturate the root ball and planting mix. Add planting mix where any settling or air pockets occur.
    e) Stake all trees/palms immediately after planting as detailed.

2. Palms: New Washingtonia palms shall be cleaned (skinned) completely of their leaf stem bases and fibers to a height 4 feet below the crown. Sabal palms shall be planted with their leaf stem bases remaining but cleaned and trimmed evenly. All palms shall be planted with several petioles or fronds tied up straight with natural twine. Remaining fronds shall be trimmed or 'hurricane cut' to lighten wind load on terminal bud. Contractor is responsible for removing or cutting the twine supporting the fronds at the appropriate time. All palms must be inspected and approved on site by SSP Design prior to installation.

3. Shrubs: All plants shall be of species denoted on plans and shall be container-grown material at specified sizes. All plants shall be of size equal or greater than T.A.N. standards for their respective container size. All material shall be vigorous, well established, of good form consistent of species, free of disease and insects, with large healthy root systems and with no evidence of being restricted or damaged. All plants shall be inspected and approved on site by SSP Design prior to installation.

4. Planting Holes: All tree/palm holes shall be excavated with a diameter at least two times the rootball size and to a depth equal to the height of the rootball. The bottoms and sides of each hole shall be scarified with a pick to allow for free drainage and maximum root penetration. After tree/palm placement, the hole shall be backfilled with a mixture of excavated soil and premium compost mixture (9 Kids Compost or approved equal). All holes shall be tested/inspected by SSP Design for free drainage prior to installation of trees.

5. Tree Rings: Tree rings shall be installed on trees within grass areas as indicated on plans. Tree rings are to be aluminum edge or extruded concrete per plans and details. A minimum of 2 inches of specified mulch shall be placed within the tree rings. Tree rings must be maintained and kept free of weeds during the entire maintenance period.

6. Watering Basins: Watering basins for all trees/palms that do not include a tree ring shall be constructed in a ring shape around each tree or palm trunk. This earthen berm shall be constructed 6" in height and 36" in diameter so as to hold water and allow infiltration around root ball. A minimum of 2 inches of specified mulch shall be placed within the watering basin. Watering basins must be maintained and kept free of weeds during the entire maintenance period.

J. Insect and Disease Control: Apply treatment as frequently as required during construction and 90-day maintenance period to prevent damage to plant material. Use only chemicals specifically approved by TNRCC.

K. Pruning: All existing and new vegetation shall be pruned/trimmed by a Certified I.S.A. Arborist as directed on site by SSP Design.

3.03 CLEANUP AND PROTECTION

A. Remove debris from landscaped areas daily and sweep clean adjacent pavements, if soiled by landscape activities.
B. Provide temporary barriers or fences as required to protect landscaping from any type of damage or theft until final acceptance.

3.04 CLOSE-OUT DOCUMENTS

A. As-Built Drawings: Submit 'As-Built' drawings before project close-out showing the landscape layout, including revised plant material, and other installation information.

B. Warranty Letters: Submit warranty letters for trees / palms / lawns / shrubs / pavers / furniture / masonry / stone / amenities.

END OF SECTION

SECTION 02902 – VEGETATION PROTECTION & RELOCATION

PART 1 GENERAL

1.01 SCOPE

General: Section Includes: Labor, materials, necessary equipment and services to complete the tree protection and relocation work.

NOTE: This project is an existing campus with existing irrigation, lawns and landscape. Contractors shall protect or demo as shown all existing irrigation, lawns, landscape, etc. Any damage whatsoever to existing irrigation, landscape or lawns labeled to remain or to be protected shall be repaired and replaced at contractor's expense. All existing landscape shall be maintained throughout construction and until final acceptance by Owner / GMS / SSP.

A. Related Section:
   1. 02900 - Planting.
B. Before tree excavation, pruning, removal, or relocation of existing trees, contractor shall engage a certified arborist (ISA Certified) and notify and meet with:
   1. SSP
   2. Appropriate utility companies for spotting and coordination of service disconnection as necessary to complete work.
   3. All other trades associated or affected by this work.

1.02 REFERENCES

A. General: "Hortus Third," 1976.
B. Texas Association of Nurserymen, Grades and Standards for Nursery Stock.
C. Plant Material: "American Standard for Nursery Stock," ANSI Z60.1-1990.
D. NAA: National Arborist Association Standards
E. ISA: International Society of Arboriculture

1.03 SCHEDULE OF VALUES

A. Landscape subcontractor shall submit costs for GC schedule of values as follows:.

   1. Tree or palm pruning (ISA Certified Arborist)
   2. Tree or palm preparation, relocation, fertilization, mulching, watering system

1.03 DEFINITION

A. Toxic Substances:
   1. Do not deliver any toxic substance or item to the site without furnishing to the owner a Texas Material Safety Data Sheet (MSDS).
   2. Provide current MSDS information with each initial shipment.
   3. The MSDS shall contain the following information:
      a. The chemical name and the common name of the toxic substance.
      b. The hazards or other risks in the use of the toxic substance, including:
         1) The potential for fire, explosion, corrosivity and reactivity.
         2) The known acute and chronic health effects of risks from exposure, including the medical conditions which are generally

recognized as being aggravated by exposure to the toxic substance.

3) The primary routes of entry and symptoms of overexposure.

c. The proper precautions, handling practices, necessary personal protective equipment, any other safety precautions in the use of or exposure to the toxic substance including appropriate emergency treatment in case of overexposure.

d. The emergency procedure for spills, fire disposal, and first aid.

e. A description in lay terms of the known specific potential health risks posed by the toxic substance intended to alert any person reading this information.

f. The year and month, if available, that the information was compiled and the name, address, and emergency telephone number of the manufacturer responsible for preparing the information.

1.04 DESCRIPTION

A. Protect existing trees to remain during construction phases. Provide tree protection fencing around all trees to remain and barriers for existing trees adjacent to tree transplantation operations. Any trees designated to remain that are scarred, damaged or destroyed shall be replaced at the Contractor's expense, with similar species, size, and quality. Provide temporary watering methods for trees and vegetation to remain on site – hand water if required. Watering schedule shall be coordinated by contractors' certified arborist in conjunction with Owner.

B. Relocate trees/palms as noted on plans. Store and maintain relocated trees/palms in contractor's nursery during construction. Storage and maintenance includes regular watering (or drip irrigation), fertilizing and pruning as necessary for healthy growth. Storage area in contractor's nursery must be approved prior to relocation. Relocate stored material on site in locations shown on final landscape plans or as directed by SSP.

C. Resulting tree pits of relocated material on site shall be backfilled with clean top soil fill and brought back flush with surrounding grade, unless the pits are to be immediately replanted. Stabilize/compact grade if required. Correct problems caused by erosion, wind, etc., in the reclaimed area. Pits to be quickly replanted shall be surrounded by safety barricades to prevent accidental falls into pits.

1. In areas where new plant material will replace relocated plant material, appropriate planting soil mix shall be used as backfill.

B. Remove other vegetation per plans or as directed by SSP to accommodate new plantings. Prepare areas to be planted according to Section 02900.

1.05 SUBMITTALS

A. Submit certified arborist information, protection measures & materials, pruning/trimming/watering schedule, for use in tree protection for approval by SSP.

B. Submit a list of equipment, procedures, and labor force anticipated for use in tree relocation for approval by SSP.

C. Submit a daily/weekly schedule indicating trees/palms to be dug and relocated. Note materials requiring root pruning, and that the relocation schedule is to begin at the end of the specified root pruning period.

D. Obtain permits required by the local tree or landscape ordinances which may include meeting with the local City or Urban Forester.
E. Submit written certification that trees indicated to remain have been protected during the course of construction according to industry standards. Certify that where damage did occur:
   1. Trees were promptly and properly treated.
   2. Indicate which damaged trees (if any) are incapable of retaining full growth potential and are recommended to be replaced.

1.06 QUALITY ASSURANCE

A. The Contractor's crew used for the relocation of existing trees shall have minimum 10 years' experience in relocation of existing plant materials and shall include an ISA Certified Arborist.
B. Unless otherwise specified, tree transplanting shall comply with NAA Ref.1.
C. Comply with NAA standards for pruning and remove branches from trees to remain to clear new construction.
D. Recommend procedures to compensate for loss of roots (if any) and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.
E. Perform tree repair work for damage incurred by new construction.
F. Provide routine progress evaluation reports on relocated trees until the end of the maintenance period.
G. Evaluate existing trees and verify trees are free of disease and ready to survive relocation from the site to their new location on-site or off-site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Properly handle trees and palms during moving so trunks will not be scarred or damaged and to avoid broken limbs. Broken limbs not causing the tree to be rejected shall be repaired as follows:
   1. Properly prune dead, dying, or damaged branches with clean, sharp equipment.
   2. Remove injured bark and wood of a tree would with a clean, sharp knife to a point where healthy bark and wood make contact at their margins.
   3. Inspect and treat wound for insect and disease.
   4. Seal wounds with bituminous base wound paint for all limbs greater than 3 inch diameter.
B. Transport trees on vehicles of adequate size to prevent overcrowding, broken limbs, foliage damage, or root ball damage.
C. Keep root balls moist during relocation.
D. Protect tree crowns with shade cloth to prevent desiccation and wind burn. Crowns shall be periodically sprayed with water to help ensure against desiccation.
E. Handle plant material only in ways and means accepted by industry standards and accepted by Owner.
F. Plant material shall be planted the same day it is dug. Coordinate preparation of planting pits or temporary nursery accommodations to ensure this schedule.

1.08 WARRANTY

A. For protected/preserved trees or palms that die due to contractor negligence during construction, replace their canopy area with new trees as specified:
   1. Canopy spread for trees shall be a minimum of six feet and a caliper of at least 3 inches. Height for replacement palms shall be a minimum of six clear trunk feet.
   2. Replacements (mitigation plantings) shall be provided at no additional cost to the Owner.
   3. Proposed replacement canopy tree species shall be approved by Owner.
   4. The specification requirements for trees and palms are according to Section 02900.

B. For relocated trees or palms that die, replace their canopy area with new trees as specified:
   1. Canopy spread for trees shall be a minimum of six feet and a caliper of at least 3 inches. Height for replacement palms shall be a minimum of six clear trunk feet.
   2. Replacements (mitigation plantings) shall be provided at no additional cost to the Owner.
   3. Proposed replacement canopy tree species shall be approved by Owner.
   4. The specification requirements for trees and palms are according to Section 02900.

C. Repair damage to other plants and lawn or construction work within the relocation area during tree transplantation at no cost to the Owner. This includes, but is not limited to, damage to curbs, walks, roads, fences, site furnishings, etc. Replacing and replanting of damaged trees, shrubs or turf shall be according to Section 02900.

1.09 MAINTENANCE

A. Maintain protected/preserved and relocated plant materials throughout construction period and continue until the 90 day maintenance period is complete, upon which time the Owner will take over maintenance of materials following procedures and recommendations of contractor and specifications.

B. During the maintenance period, maintain protected and relocated plant materials according to procedures described in Section 02900.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tree Protection Fence: Tree protection fence shall be a minimum of four feet high. Chain Link Fencing (No 9. GA. 2" Mesh with 2" Posts, driven at least 2' into ground @ 6 foot intervals or approved equal-see details on plans for alternate tree protection fencing).

B. Tree Protection Signage: Vegetation Protection Areas shall be labeled "Vegetation Protection Area". Signs shall be laminated or otherwise weatherproof and printed in bold text so as to be easily read from a distance of 20 feet. Wording on signage shall be provided in both English and Spanish.

C. Compost, topsoil, planting soil, mulch, staking, and guying, shall be as specified in section 02900.

D. Fill materials shall be as specified in Section 02900.

PART 3 EXECUTION

3.01 VEGETATION PROTECTION

A. Initial Work: No other construction activity may occur on site until Tree Protection Fencing has been installed and approved by SSP.
B. Construction Activity: All construction activity within the areas fenced off around the trees shall be prohibited. This shall include the following activities:
    1. Parking or driving of equipment, machinery or vehicles of any type.
    2. Storage of any construction materials, equipment, stockpiling, excavation or fill, soil, gravel, etc.
    3. Dumping of any chemicals, (i.e. paint thinner from cleaning brushes), wash-out materials from cleaning equipment, concrete or mortar remainder, trash, garbage, or debris of any kind.
    4. Burning within or in proximity to protected areas.
    5. Felling trees into protected areas.
    6. Trenching or grading within the Critical Root Zones of protected trees for any purpose without notifying Owner 10 days in advance of operation in writing. This includes utilities, lighting, irrigation, drainage etc.
C. Tree Protection Areas: Any work required by plans which is in a Tree Protection Area shall be performed by hand. All work shall be performed in a manner to prevent compaction, siltation and disturbance of the root systems of all associated trees and understory trees. At no time shall tree protection fencing be removed or relocated without permission of Owner.
D. Subcontractor: The general contractor shall be responsible for insuring that all subcontractors are aware of all Vegetation Protection Specifications.
E. Critical Root Zone: Contractor may operate equipment within the root zone of trees to be preserved only if buffered with 1/2" plywood with a 6” layer of wood chips underneath; or 12 inches of wood chips. Approval from Owner is required prior to operation of any equipment in tree protection areas. Root protection measures shall be inspected and maintained throughout construction.
F. Location: Contractor will be responsible for installation, repairs and upkeep of tree protection fencing around trees and groups of trees to be preserved. See plan for locations.
G. Flagging: Prior to installation, Contractor shall flag or paint location of fencing in field for verification by Owner.
H. Contractor shall include supply, installation, maintenance, and removal of fencing in bid.
I. Tree Protection Fence: Fencing shall remain in place and be continuously maintained for duration of construction.
J. Watering: Contractor shall engage ISA Certified Arborist to coordinate and submit watering schedule for approval by Owner. Watering shall be scheduled as required specific species, soil conditions, and time or year.
K. Damage: Contractor will provide services as necessary to respond to damage by construction activities within 48 hours of notification by the Owner.

L. Penalties: Failure to comply with specifications will result in penalties as prescribed herein and by local codes and ordinances.

3.02 TRANSPLANTATION

A. Transplanting shall consist of on-site or off-site transplanting of existing trees or palms from proposed construction areas to storage areas to permanent locations as noted on the drawings.

B. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development.

C. Balled and Burlapped Plants:

1. Balls shall be firmly wrapped with wire mesh, burlap or accepted cloth substitute.
2. No balled plant will be acceptable if the ball is cracked and broken or if the stem or trunk is loose in the ball, either before or during transplanting.
3. Balled plants shall be lifted and handled from the bottom of the ball.
4. Protect ball and deliver to the site, plant immediately, and water thoroughly.
5. Ball sizes shall be as recommended in ANSI Z60.1

3.02 PLANTING

A. Relocated Material:

1. Relocated trees/palms shall be planted according to procedures described for new material, Section 02900. Verify final grades have been established before planting operations. Ensure proposed planting pits drain freely by test-filling with water before transplantation.
2. Continue watering and caring for relocated material as specified.
3. Mulch tree pit areas to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuations.
4. Brace trunk and leave in place for approximately one year until trees are wind firm.
5. Wrap trunks and structural branches of thin-barked trees to protect against sun scald and dehydration. Retain through at least one growing season, and through hurricane season.
6. Feed with a diluted solution of N-P-K in solution form with a soil needle, providing water, air, and nutrients.
7. Where foliage is retarded, spray with soluble type foliage feeder.
8. At time of planting, fill air pockets and keep roots, especially feeder roots, moist, live, and healthy. Use soil needles for watering new transplants. Direct fine spray at foliage to help harden-off new leaves.

3.03 STAKING AND GUYING

A. Stake and guy designated material according to procedures described for new plant materials, Section 02900.

3.04 WATERING

A. Following transplantation, water trees daily for the first two weeks, every other day for the next three weeks, and every third day for the balance of the three month

watering/maintenance period. Such watering shall thoroughly saturate the root ball to its full depth.

B. Following relocation, trees designated for transplanting shall be watered as specified in this section. Such watering shall thoroughly saturate the root ball to its full depth.

C. Provide temporary automatic or manual watering of protected/preserved trees and relocated plant materials during construction and for 90 days after substantial completion. If used, after 90-day maintenance period, Contractor shall be responsible for the complete removal of all temporary watering systems.

3.05 TAGGING

A. Trees within the designated areas for relocation shall be clearly marked by means of yellow plastic surveyor's ribbons and coordinated with, inspected, and accepted by Owner before root pruning and digging.

3.06 ROOT PREPARATION

A. Trees to be relocated shall be root pruned at least 45 days before digging with clean, sharp equipment.
   1. Maintain root pruned materials by watering, weeding, mowing, spraying, fertilizing, and other horticulture practices.
   2. After root pruning, backfill with good rooting medium, fertilize with organic fertilizer to promote root growth.
   3. Mulch to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuation.

B. Root Ball Size Chart: Root ball sizes shall be according to minimum standards set forth in Texas Association of Nurserymen, Grades and Standards for Nursery Stock.
   1. Trees-Minimum Ball Sizes:

Caliper Minimum	Ball Diameter (Larger sizes increase proportionally)
3-1/2" to 4"	28"
4" to 4-1/2"	30"
4-1/2" to 5"	32"
5" to 5-1/2"	34"

   2. Minimum Ball Depth:

Ball Diameter	Depth
Less than 20"	Not less than 75 percent of diameter.
20" to 30"	Not less than 65 percent of diameter.
30" to 48"	Not less than 60 percent of diameter.

3.07 CROWN PREPARATION

A. Shade and Flowering Trees:
   1. Shade Trees: ISA Certified Arborist to selectively prune and thin crown to remove approximately one third of the branches. Preserve the basic shape and form of the tree, eliminate cross-branching and dead or diseased branches.

2. ISA Certified Arborist to hand strip selected species of all leaves following pruning and before moving.

B. Palms: Follow standard procedure for transplantation of palms as specified in Section 02900.

3.08 HAND DIGGING

A. Burlapping is required. Trees that are burlapped for relocation shall comply and be handled in same manner as new plant material specified in Section 02900.

3.09 SPECIAL CONDITIONS

A. Multi-Trunk Trees: Relocate multi-trunk tree as one unit. Measure trees by taking the aggregate total of all DBH measurements.

B. Multi-Trunk Palms: Relocate multi-trunk palms as one. Palms shall be measured as follows:

1. 50 percent of the value in dollars of the largest trunk in the grouping times the number of trunks in the clump.

C. On/Off-site relocation:

1. Relocation shall include root pruning, canopy pruning, on/off-site transportation, off-site storage, watering and maintenance, hauling and dumping of debris, and 90-day maintenance after final planting.
2. If the tree or palm should die within the 90 day maintenance period, remove the tree, replace the material, and restore the site at no additional cost to the Owner.

3.10 CLEANING

A. Site Clean-up:

1. Upon completion of each day's work, thoroughly clean up the project site.
2. Remove equipment, unused materials, deleterious material, and surplus excavated material.
3. Fine grade all disturbed areas and the areas adjacent to the transplanted material to provide a neat and uniform site.
4. All damaged or altered existing structures, as a result of the landscape work, shall be corrected.

END OF SECTION

SECTION 02930 – LAWNS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: The establishment of a complete and uniform lawn by sodding and/or hydromulching.

B. Related Sections:

1. Section 02810-Irrigation
2. Section 02900-Planting

NOTE: This project is an existing campus with existing irrigation, lawns and landscape. Contractors shall protect or demo as shown all existing irrigation, lawns, landscape, etc. Any damage whatsoever to existing irrigation, landscape or lawns labeled to remain or to be protected shall be repaired and replaced at contractor's expense. All existing landscape shall be maintained throughout construction and until final acceptance by Owner / GMS / SSP.

1.02 QUALIFICATIONS

A. Lawn work to be performed by a single firm specializing in commercial landscape work with a minimum of five (5) years experience on similar type projects. Owner/SSP Design to review qualifications and approve subcontractor prior to commencing work.

1.03 SCHEDULE OF VALUES

A. Landscape subcontractor shall submit costs for GC schedule of values as follows:

1. Irrigation Sleeving
2. Irrigation Water Meter, Backflow, Permits, Testing
3. Irrigation System
4. Landscape Athletic Field Grading and Soil Mix
5. Landscape Athletic Field Sod
6. Landscape Planting, Materials, Installation, Warranty
7. Landscape / Irrigation 90 Day Maintenance

1.03 SUBMITTALS

A. Submittals shall be formatted electronically in a pdf file with a table of contents and tabs identifying each section. The following submittals are required for this section:

1. Product Data: Manufacturer's specifications and application instructions for fertilizer.
2. Hydromulch mixes, percentages, lbs per acre, etc. for SSP review and approval before application.
3. Samples: Topsoil, compost, silica/masonry sand for SSP review and approval before installation.
4. Certificates: Inspection certificate from Texas Department of Agriculture indicating sod has been found free of, insects and larvae.
5. Certificates: Breakdown of seed types, percentages, and mixture composition.
6. Sod Delivery Tickets: One per truckload indicating sod species, nursery certification,

date and time of cutting. diseases

1.04 DELIVERY, STORAGE AND HANDLING

A. Sod Delivery: Have sod delivered within forty-eight hours of cutting. Stack sod with roots to roots, protected from exposure to elements during shipment.

B. Storage: Lay sod as soon a practicable after delivery. If installation is delayed more than four hours, store sod under shade and keep constantly moist. Sod must be laid within forty-eight hours of cutting. Do not pile more than two foot depth of sod. Do not tear, stretch or drop sod. Do not allow soil to break free of turf roots.

1.05 PROJECT CONDITIONS

A. Utility Construction: Do not lay sod or begin hydro-mulching until all underlying utility work is complete, trenches backfilled, compacted and graded, and topsoil placed and fine graded and sports fields laser leveled and approved by Owner/SSP.

1.06 MAINTENANCE/WARRANTY

A. Maintenance Service: Maintain the work of this Section throughout construction until the Date of Substantial Completion and ninety (90) days thereafter until a complete and uniform lawn has been established and accepted by the Owner / SSP.

1. Establish hydro-mulched or sodded lawns per planting plans. Reapply hydro-mulch or re-sod as necessary until **full and uniform** coverage is obtained.
2. Mow general lawn areas **at least once per week** to maintain height of grass at 2 inches for 'common Bermuda grass' and 1" for 'Bermuda 419 sodded grass' and or as directed by Owner/SSP. Mowing of general lawn areas may be carried out using standard rotary type mowing equipment.
3. Mow Sports Fields **at least twice per week** to maintain an initial height of 1" for the establishment period then begin lowering the height over the next 90-days to achieve a final height of 5/8" to ¾". Mowing of Sports Field areas shall be carried out using reel type mowers only. Rotary mowers will not be accepted for Sports Field maintenance.
4. Trim/edge all lawn areas adjacent to watering basins, pavements, driveways, walls, structures, curbs, planting beds, edges and islands.
5. Provide insect and disease control to maintain health of grass.
6. Apply pre and post emergent herbicides as required or directed to control weed growth throughout the establishment and maintenance periods.
7. Fertilize general lawn areas (minimum two applications) with balanced commercial grade lawn fertilizer until complete and uniform coverage is obtained.
8. Fertilize Sports Field areas (minimum four applications) using a high nitrogen formula such as HJ 25-0-0 with Wolftrax or Scotts Sierrablen 27+5+5+Fe or Scotts Fairwaymaster 20+5+8 or approved equal.

   Note: Submit fertilizer type for SSP review and approval prior to application. Depending on time of year, SSP may require a fertilizer that includes pre or post emergent herbicide.

9. Verti-cut or de-thatch Sports Field turf at least one time at the end of the maintenance period.
10. Apply top dressing (clean inorganic sand-see below) to level any divots, depressions or low spots during the maintenance period. Top dressing must be completed utilizing a mechanical top dressing machine and applying a minimum of 1/2" depth sand layer over entire field surface. (approx. 90 cubic yards of sand required).
11. Irrigation:
    a) If the irrigation system is operating, program and monitor the system to provide adequate water for grass.
    b) If the irrigation system is not operating, hand water grass.
12. Submit receipts/dates of all maintenance operations to SSP Design for approval.

B. Warranty: Warranty shall cover all lawn grasses for a period of three months from the date of final acceptance. Final acceptance will not be approved until full and uniform lawns are completely established and proof of all fertilizations including receipts have been reviewed and accepted.

PART 2 PRODUCTS

2.01.1 MATERIALS

A. Fill Soil (sub-grade): Fertile agricultural screened topsoil or amended topsoil from site with amendments as required by soil testing lab. Use of existing site soil is prohibited until a full soil analysis/test has been completed by a certified soil testing lab. Contractor to provide testing of at least two samples from the existing soil proposed for use and submit soil test listed below for SSP / Owner review and approval. Use of existing soil for grading and fill is not acceptable until test results have been submitted and approved.
https://www.soilkits.com/so55.html SO-55♣ TPSL® Turfgrass, Lawns & Athletic Fields Specific Test, Item# SO-55, Texas Plant & Soil Lab, Main Phone 956-383-0739, Fax Line 956-383-0730, Address 4915 West, Monte Cristo Road, Edinburg TX 78541

B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0; organic matter to exceed 1.5%, magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.

C. Sand: For athletic/sports fields. Silica sand, clean, screened and free of debris. (Mathis Sand, Wright Materials Plant-3, Tel. (361) 387-0293 or approved equal). Also for use with top dressing as required by item 10 above.

D. Sod: (See schedule for type). Provide premium #1 certified sod grown in a sod nursery on sandy soil, at least 1 yr. old with a heavy top and a strong, well-knit root system, and not more than five percent weeds or foreign grasses. Palleted sod is acceptable for general lawn areas. Large Roll sod (42" width rolls) is required for athletic fields. (King Ranch Turf Grass or approved equal)

E. Hydromulch Material. Material for hydraulic mulching shall consist of virgin wood fibers manufactured expressly from clean whole wood chips. The chips shall be processed in such a manner as to contain no growth or germination inhibiting factors. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and pure plants. The wood cellulose fiber mulch shall be dyed green to aid in visual metering during application. The dye shall be biodegradable and not inhibit plant growth. The wood cellulose fibers of the mulch must maintain uniform suspension in water under agitation. Upon application, the moist material shall form a blotter-like mat covering the ground. This mat shall have the characteristics of moisture absorption, percolation, and shall cover and hold seed in contact with the soil. The Contractor shall obtain certifications from suppliers that laboratory, field-testing of their product has been accomplished, and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch. Terra-Mulch Terra-Blend with UltraGro or approved equal.

F. Fertilizer: Starter fertilizer (BCF 15-15-15) shall be used in hydro-mulch mix. The Contractor shall provide a Soil Analysis Report and shall use report to determine quantity and ratio of fertilizer for sustained growth of grass.

G. Soil and Mulch Tackifier: Tackifier used with mulch shall be organic. Tackifier shall be mixed and applied with the hydromulch at an appropriate rate to stabilize soils and minimize erosion. Tackifier shall be pH stable with fertilizer and shall hydrate and disperse in mixing tank with water and other materials to form homogeneous slurry. Tackifier shall leave loose, chain-like stabilizing film on surface of soil, allow moisture to percolate into soil during seed germination and seedling growth, and break itself down through microbial action. Tackifier shall not inhibit plant germination or growth.

1. Organic Tackifier. Organic tackifier shall be, starch-based tackifier formulated for use with conventional mulches. Active ingredient in tackifier shall be 100 percent derived from plant starch.

2. Dry powder tackifier shall be blended with insolubilizer. After blending and mixing with water, tackifier shall swell, become sticky, and be suitable for use during heavy rain. Tackifier shall be applied at rate of 80 pounds per acre. Emulsion shall cure on surface of soil and become insoluble. Tackifier shall not inhibit plant germination or growth.

H. Fertilizer: 12-4-8 (N-P-K), formulated for slow-release Nitrogen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the site and conditions under which this work is to be performed. Have the installer notify the Contractor in writing, with a copy to SSP Design, if the site is unsatisfactory. Do not begin the work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Beginning of work indicates acceptance of the site as satisfactory by the installer.

3.02 PREPARATION

A. Topsoil: Refer to Section 02900 ‘Landscaping’ for topsoil amendment.

B. Site Preparation: Contractors must visit and review site prior to bidding. Compacted soils and sub-soils from construction activities must be ripped and tilled until a loose, friable and free-draining condition is met. All existing weeds, grass, stabilized sub-base material, rubble, excavated soil and other material shall be removed from the site and disposed of by the contractor prior to starting any new landscape work. Soil conditions around entire site must be approved by SSP Design prior to rough and finished grading operations. Contractor shall not install any fill or topsoil in landscape areas prior to site condition approval by SSP Design.

3.03 INSTALLATION – HYDROMULCH / SOD

A. All exterior ground within the limit of contract or any damaged adjacent areas, except surfaces occupied by structures and paving, except areas indicated to be undisturbed, shall be seeded, hydromulched, sodded or planted as shown on drawings. Furnish topsoil (if required or specified in plans/schedules), provide finish grading, prepare seed bed, seed, hydromulch, sod and maintain areas as indicated on the drawings.

B. Lawn Area Preparations - Grade areas to finish grades, filling as needed or removing surplus material. Float all lawn areas to a smooth, uniform grade as indicated on engineers grading plans. All lawn areas shall slope to drain away from structures and planting beds. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basin, elevational steps or structures) and elevations shown on plans. Contractor to ensure proper drainage around all structures. Adjust grades as necessary to direct water away from structures and planting beds. Report any discrepancies on all drainage issues in writing to SSP Design or the project engineer.

C. Roll, scarify, rake and level as necessary to obtain true, even lawn surfaces. All finish grades shall meet approval of the SSP, before seeding/hydromulching operations. Loosen soil to a depth of six inches (3") in lawn areas by approved method of scarification and grade to remove edges and depressions. Remove stones or foreign matter over one half inch (1/2") in diameter from the top two inches (2") of soil. Float lawn areas to finish grades as shown on civil plans. Install topsoil over prepared subbase if included in materials schedules or as required to allow for a proper seed bed for germination and strong healthy growth of sod.

D. Lawn areas should be permitted to settle or should be firmed by rolling before hydromulching or sodding.

E. Hydromulching shall not be performed in windy weather.

F. Lawn areas shall be seeded by hydro-mulching evenly with an approved mechanical hydro-mulcher at the rate of a minimum of three (5) pounds per 1,000 square feet. In areas inaccessible to hydro-mulching equipment, the seeded ground shall be lightly raked with flexible rakes and rolled with a water ballast roller. After rolling, seeded areas are to be lightly mulched with wheat straw or approved material.

G. Lawns shall be maintained by the Contractor for at least 90 days after substantial completion or as long as necessary to establish a uniform stand of the specified grasses, or until final acceptance of lawns, whichever is later.

H. Water hydromulched / sodded areas to a minimum depth of six inches (6") with a fine spray as necessary to the equivalent of one inch (1") per week. Increase or decrease watering based on season and weather / rainfall amounts.

I. The surface layer of soil for hydromulched areas must be kept moist during the germination period. Set irrigation controller to short (5 minute) cycles, multiple times per day to keep hydromulch moist but prevent runoff and erosion. Any eroded areas of hydromulch must be regraded and re-hydromulched.

J. Sod shall be installed to all areas as indicated on plans.

K. Sod Bed Preparation – See A, B, C, D above. All lawn areas are to slope to drain.

L. Sod shall be laid within 48hrs of being cut or 24 hours after delivery to the project site. Only healthy vigorous growing sod is to be laid. Any stressed or yellowing sod shall be rejected.

M. Always lay sod across slope and tightly together so as to make a solid area. All rolls or pieces of sod must be butt-jointed with no open joints. Any open joints will require clean sand or topsoil fill and re-leveling and rolling.

N. Roll all new sod sufficiently to set or press sod into underlying soil and provide a smooth and even finished surface. Mechanical 2 ton roller or equivalent is required.

O. After sodding has been completed, clean up and thoroughly moisten by sprinkler newly sodded areas.

P. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions

Q. After grass growth has started, all areas or parts of areas, which fail to show a uniform stand of grass for any reason whatsoever shall be re-hydromulched or sodded in accordance with the plans and as specified herein. Such areas and parts of areas shall be hydromulched or sodded repeatedly until all areas are covered with a full and uniform stand of grass at no additional cost to the Owner.

R. Watering shall be done in such a manner and as frequently as is deemed necessary by SSP to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.

S. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the seeded area in an approved manner.

T. Mowing of the seeded, hydromulched or sodded areas shall be initiated when the grass has attained a height of one and one-half to two inches (1-1/2" to 2"). Grass height shall be maintained between one and one and one-half inches (1 to 1½") at subsequent cutting depending on the time of year. Not more than one third (1/3) of the grass leaf shall be

removed at any cutting and cutting shall not occur more than seven (7) days apart.

U. When the amount of grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother or takeover the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by the SSP.

V. Protect hydromulched / sodded areas against trespassing and damage while the grass is germinating and/or growing in. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout, settlement or other causes shall be repaired by the Contractor at his expense.

W. Remove all fences, signs, barriers or other temporary protective devices after final acceptable.

3.04 FERTILIZING – GRASS

A. General lawn areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following each application. The first application shall be one (1) week after the hydro-seeding using a 'starter fertilizer' at manufacturer's recommended rates. The second application shall be done after 30-60 days with an approved turf builder fertilizer at manufacturer's recommended rates and as approved by SSP.

B. Sports Field areas shall have a minimum of four (4) applications with a thorough watering immediately following each application. The first application shall be one (1) week after the hydro-seeding using a 'starter fertilizer' at manufacturer's recommended rates. Subsequent applications shall be done after 30 days, 60 days and 90 days with a balanced or higher nitrogen fertilizer at manufacturer's recommended rates and as approved by SSP.

C. Soil analysis and time of year shall be considered with SSP to determine fertilizer type, composition and final application rates. Submit fertilizer type and analysis to SSP for approval before any application. Document fertilizer application with photos and receipts of fertilizer purchases.

3.05 CLEANUP AND PROTECTION

A. Remove debris from landscaped areas daily and sweep clean adjacent pavements, if soiled by landscape activities.

B. Protect lawns from any type of damage, theft or vandalism until final acceptance. Install stakes and flagging or temporary fencing if required to keep traffic off newly established lawn areas until final acceptance.

END OF SECTION

SECTION 031000 - CONCRETE FORMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in-place concrete including shoring, bracing and anchorage.

B. Openings for other Work.

C. Release agents and other related form accessories.

D. Form stripping.

1.2 RELATED SECTION

A. Section 032000 - Concrete Reinforcement

B. Section 033000 - Cast-In-Place Concrete

1.3 REFERENCES

A. American Concrete Institute (ACI):

1. 347, Recommended Practice for Concrete Formwork.

1.4 DEFINITIONS

A. Concealed: For Work required under this Section, the term "concealed" will mean "not exposed to view in finished construction."

B. Exposed: For Work required under this Section, the term "exposed" will mean "exposed to view in finished construction."

1.5 QUALITY ASSURANCE

A. Grading Rules. Rules of the following associations apply to materials furnished under this Section:

1. Southern Pine Inspection Bureau (SPIB).
2. Western Wood Products Association (WWPA).

B. Tolerances: Follow ACI 301 (Table 4.3.1).

1.6 DELIVERY, STORAGE AND HANDLING

A. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.7 DESIGN CRITERIA

A. Design, engineering, fabrication, erection, maintenance and removal of formwork shall be responsibility of Contractor.

B. Construct forms following ACI 318, ACI 347, OSHA, state and local requirements.

C. Provide forms with sufficient strength to withstand pressures resulting from concrete placement and vibration.

D. Responsibility for properly bracing and shoring to support subsequent construction loads rests solely with Contractor.

E. Responsibility for removal of forms at any time before concrete has obtained certified specified design strength rests solely with Contractor.

F. The Engineer’s efforts are aimed at designing a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job Site safety during construction which are exclusively Contractor's responsibility. Processing and/or approving submittals made by Contractor which may contain information related to 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 safety procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS / PRODUCTS

A. Use forms specified in the general notes of the structural drawings. Provide in largest practical sizes to minimize number of required joints.

2.2 MATERIALS

A. Wood Form Materials:

1. Reference general structural notes in sheet S1.1 for wood grade requirements.

B. Preformed Steel Forms: Minimum 16 gauge (0.06"/1.5mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Form Release Agent: Colorless chemical form coating or mineral oil which will not stain concrete or absorb moisture.

D. Form Ties: Standard coil or snap galvanized adjustable ties with 3/4" diameter plastic cones on exposed surfaces. Provide manufacturer's recessed plugs of gray plastic or concrete to seal tie holes.

E. Nails, Spikes, Lag Bolts, Through Bolts and Anchorages: Sizes required; of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork.

B. Verify that dimensions agree with drawings.

3.2 ERECTION / INSTALLATION / APPLICATION

A. Follow ACI 301 and 347.

B. Provide forms as follows:

1. Concealed Surfaces: Rough or board form finish left by clean, straight formed lumber.
2. Exposed Surfaces (Typical): Hardboard or plywood lined concrete forms.

C. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over-stressing by construction loads.

D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.

E. Align joints and make watertight. Keep form joints to minimum.

F. Obtain approval before framing openings in structural members which are not shown.

G. Provide 1" chamfer strips in exposed exterior corners of beams, girders, columns, walls or foundation forms, around tops of all foundation slabs and elsewhere shown.

H. Provide temporary ports or openings in formwork required for cleaning out debris, adjusting reinforcing steel and to facilitate inspection.

I. Coordinate with Work of other Sections which require attachment of components to formwork.

J. Coat forms with non-staining form release agent. No other coating will be permitted unless specifically approved by Architect.

K. Inserts, Embedded Parts and Openings:

1. Provide formed openings required for items to be embedded in or passing through concrete Work.
2. Locate and set in place items which will be cast directly into concrete.
3. Coordinate with Work of other Sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, collars, thimbles, ties, sockets, nailing blocks, other inserts and components of other Work.
4. Obtain required setting information before proceeding.

L. Install accessories following manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.

M. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
2. Loosen forms carefully. Do not wedge pry bars, hammers or tools against exposed concrete surfaces.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

N. Do not construct any masonry walls on concrete floors or walls until concrete has attained its design strength and forms and shoring have been removed.

O. Terminate embedded form ties 1-1/2" from formed face of concrete. Construct ties so that ends and fasteners can be removed without causing spalling of face of concrete.

P. Repair form tie holes as follows:

1. Below Grade Surfaces: Fill tie holes with waterproof bituminous mastic to prevent water infiltration.
2. Above Grade Surfaces - Concealed: Fill tie holes with compatible materials flush with adjacent concrete.
3. Above Grade Surfaces - Exposed: Fill tie holes with compatible materials flush with adjacent concrete. Repairs shall blend in inconspicuously with surrounding surfaces. Follow Section 033000.

Q. Finishes. Follow ACI 301 unless specifically shown otherwise.

3.3 TOLERANCES

A. Formwork: Follow ACI 301.

3.4 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring and bracing to ensure that Work follows formwork design and that supports, fastenings, wedges, ties and items are secure.

3.5 ADJUSTING AND CLEANING

A. Clean forms as erection proceeds to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

END OF SECTION 031000

SECTION 03200 − CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel, welded wire fabric, tie wires and other related accessories.

B. Work includes reinforcing for interior and exterior cast-in-place concrete.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete

1.3 REFERENCES

A. American Concrete Institute (ACI):

1. 301, Structural Concrete.
2. 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
3. 318, Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM):

1. A82, Cold Drawn Steel Wire for Concrete Reinforcement.
2. A185, Welded Steel Wire Fabric for Concrete Reinforcement.
3. A615, Deformed and Plain Billet Steel Bars for Concrete Reinforcement (including supplementary requirements)

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Practice.
2. 63, Recommended Practice For Placing Reinforcing Bars.
3. 65, Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.4 SUBMITTALS

A. Submit:

1. Shop drawings. Provide electronic (PDF) copies of each drawing.

a. Show reinforcing steel and wire fabric sizes, spacings, locations and quantities, bending and cutting schedules and supporting and spacing devices.
b. Indicate visual method of identification of bar strengths following ASTM standard for steel type used.

2. Certified copies of mill test reports of reinforcement materials analysis (upon request).

B. Provide submittals within 30 days after Contract date.

1.5 QUALITY ASSURANCE

A. Maintain 1 copy of each referenced document at Site.

B. Fabrication and Placement Tolerances: Follow ACI 301.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver to Site free of rust and scale, clearly marked as to bar strength.

B. Store reinforcing materials on pallets or other materials off ground. Avoid surface contamination before placement and prevent bending or warping.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel: ASTM A615, Grade 60 (60,000 psi yield strength) billet steel bars; unfinished. Provide in sizes shown on plans provide deformed bars typically and plain bars where dowels are shown.

B. Stirrup Steel: #3 reinforcing bars may by ASTM A615 Grade 40.

C. Welded Wire Fabric (WWF): ASTM A185, plain type; unfinished. Provide in sheet form not in rolls. Provide as sized if shown or as follows if not shown:

1. Provide 1 layer of 6 x 6-W2.9 x W2.9 in sidewalk and toppings 4" or less in thickness.

2.2 ACCESSORIES

A. Tie Wire: Minimum 16 gauge (0.06") annealed type.

B. Chairs, Bolsters, Bar Supports and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports and Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless steel type; sizes and shapes required.

2.3 FABRICATION

A. Fabrication: Follow CRSI Manual of Practice.

B. Locate reinforcing splices not shown at points of minimum stress.

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundations and Footings:

1. Clean excavations of loose debris and earth. Cut sides of excavations square and remove loose material.
2. Pump out standing water from excavations before placing reinforcement. Remove and replace mud or frozen soil with lean concrete.

B. Clean reinforcement completely before concrete placing. Reinforcement shall be free from loose, flaky rust, mud, oil or other coatings that would destroy or reduce bond with concrete at time concrete is placed. Reinspect reinforcement and clean off any dried cement, mortar or dirt when placement is delayed.

C. Obtain Owner's Engineer's approval of reinforcement installations prior to placement of any concrete.

3.2 ERECTION / INSTALLATION / APPLICATION

A. Position reinforcement following ACI 301, ACI 315 and drawn details.

B. Provide reinforcing steel in concrete footings, foundation walls, thickened slabs, retaining walls and elsewhere shown.

C. Provide corner reinforcing steel in footings at corners and at intersections of walls unless shown otherwise:

1. Bar size and spacing shall match wall or footing reinforcing.
2. Return bars minimum of 36 diameters on each end.
3. WELDING OF REINFORCING IS NOT PERMITTED.

D. Provide the following minimum concrete cover requirements for reinforcing steel unless shown otherwise:

1. Concrete Cast Against and Permanently Exposed to Earth: 3".
2. Concrete Exposed to Earth or Weather:
   a. #5 Bars and Smaller: 1-1/2".
   b. Others: 2".

E. Provide minimum splice requirements for reinforcing steel shown or required by ACI 318. Stagger splices so that no more than 1/2 of horizontal reinforcing steel is spliced at any given cross section.

F. Provide a bond breaker such as plastic sleeves at all dowel bars occurring at control and expansion joints.

G. Place, support and secure reinforcement against displacement. Do not deviate from required position.

1. Provide bolsters and chairs required to maintain reinforcing steel at proper elevation in slab.

H. Lap welded wire fabric minimum 6" or 1 full mesh on sides and 1 foot or 2 full meshes on ends and extend to within 2" of slab edges. Chair support welded wire fabric so that welded wire fabric is in upper half of slab while placing slabs on grade unless specifically shown otherwise.

I. Carry welded wire fabric and reinforcing steel through control (contraction) joints but not through construction and expansion joints unless shown otherwise.

1. Grease dowels thoroughly and paper wrap to allow for horizontal movement at expansion joints.
2. Cut alternate wires of welded wire fabric at control joints.

J. Take care to avoid disturbing reinforcement and vapor retarder during placing of concrete. Remove and reinstall disturbed or improperly installed reinforcement when discovered or instructed by Owner's Engineer before continuing concrete placement.

K. Accommodate placement of formed openings.

END OF SECTION 03200

03 30 001

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK COVERED

A. Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.02 QUALITY ASSURANCE

A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes. Applicable standards and codes include, but are not limited to, the following:

1. ASTM A36 - Structural Steel.
2. ASTM C33 - Concrete Aggregates.
3. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
4. ASTM C94 - Ready-Mixed Concrete.
5. ASTM C143 - Slump of Portland Cement Concrete.
6. ASTM C150 - Portland Cement Concrete.
7. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
8. ACI 301 - Specification for Structural Concrete for Building.
9. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
10. ACI 315 - Manual of Standard practice for Detailing.
11. ACI 318 - Building Code Requirements for Reinforced Concrete.
12. ACI 347 - Recommended Practice for Concrete Formwork.

B. Submit compliance submittals as specified in Division 1, including but not limited to the following: bar schedule, bar details, shop drawings including size and location of openings, waterstops, joint systems and curing method.

C. Submit proposed concrete mix proportions to Engineer prior to placing concrete.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT

A. Type I, Type II or Type III, conforming to ASTM C150, as modified by Texas State Department of Highways and Public Transportation, 1982 Standard Specifications.

B. Type I or II cement may be used unless Type II is specified.

C. Except when Type II is specified, Type III may be used when the anticipated air temperature for the 12 hours following the placement of the concrete is not anticipated to exceed 60°F.

D. Type III may be used in all pre-cast, pre-stressed concrete, except in piling when Type II cement is required for use as substructure concrete.

E. All cement used in a monolithic placement shall be of the same type.

F. Cements may be either bagged or bulk. Partially set or caked cement will be rejected.

G. All types of cements shall be "low alkali" cements.

2.02 WATER

A. Water shall be clear, fresh, free from injurious amounts of oil, alkaline, acid or organic matter, or other deleterious substances and shall not contain more than 1000 parts per million of chlorides, as Cl, nor more than 1000 parts per million of sulfates, as SO_4.

B. Water of known potable quality requires no testing. Other sources shall meet the requirements of AASHTO T-26.

C. Water shall have a pH of not less than 4.5 or more than 8.5.

2.03 FINE AGGREGATE

A. Natural sand, manufactured sand or a combination of the two, with or without mineral filler.

B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.

C. The maximum permissible percentage, by weight of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

D. Gradation, percent of weight retained:

Sieve Size	Percent Retained
3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	15 - 50
No. 30	35 - 75
No. 50	65 - 90
No. 100	90 - 100
No. 200	97 - 100

E. Fineness Modulus:

1. For Grade 1 only - 2.3 minimum, 3.1 maximum.

F. Mineral Filler:

1. May be added upon written authorization of Engineer
2. Shall be stone dust or clean crushed sand, or other approved inert material.
3. Shall not exceed 5% of the fine aggregate.
4. Shall meet the following requirements:
    a. Passing No. 30 sieve 95 to 100%
    b. Passing No. 100 sieve 70 to 100%

2.04 COARSE AGGREGATE

A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.

B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.

C. Crushed stone shall consist of the clean, dust free product resulting from the crushing of stone. There shall be no adherent coatings, clay, loam, organic or deleterious substances, salt or alkali, and other foreign material.

D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.00%
Shale, Slate or other similar material	1.00%
Clay lumps	0.25%
Soft fragments	3.00%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.00%
The sum of all deleterious substances exclusive of material removed by decantation	5.00%

E. Coarse aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.

F. Gradation, percent of weight retained:

1. Grade No. 1 - Maximum Nominal Size 2 1/2-inches (63 mm)

Sieve	Percentage Retained
2 1/2-inches	0
2-inches	0 - 20
1 1/2-inches	15 - 50
3/4-inches	60 - 80
No. 4	95 - 100

2. Grade No. 2 - Maximum Nominal Size 1 1/2-inches (37.5 mm)

Sieve	Percentage Retained
2-inches	0
1 1/2-inches	0 - 5
3/4-inches	30 - 65
3/8-inches	70 - 90
No. 4	95 - 100

3. Grade No. 3 - Maximum Nominal Size 1-inch (25 mm)

Sieve	Percentage Retained
1 1/2-inches	0 - 5
3/4-inches	10 - 40
1/2-inches	40 - 75
No. 4	95 - 100

4. Grade No. 4 - Maximum Nominal Size 3/8-inch (9.5 mm)

Sieve	Percentage Retained
1/2-inches	0 - 5
3/8-inches	5 - 30
No. 4	75 - 100

G. Gradation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the following conditions:

1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which concrete is to be placed.
2. Three-fourths (3/4) of the clear space between reinforcement.
3. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95 percent of the weight of the aggregate can be passed.
4. Unless otherwise noted or restricted by above, the Grade No. 2 gradation shall be used.

2.05 PIT-RUN AGGREGATE

A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.

B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.

C. Pit-run aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the following minimum requirements for percentages by weight:

1. Retained on 1/4 in sieve 55 to 60%

D. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and stronger.

E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.06 ADMIXTURES

A. Concrete admixtures shall comply with Section 03320.

2.07 REINFORCING STEEL

A. Reinforcing steel shall comply with Section 03330.

2.08 CURING MATERIALS

A. Liquid Membrane: white pigmented chlorinated rubber, ASTM C309.

B. Liquid Membrane: resin base, clear compound, permitting application of paint, Servicised Products Corporation - Code 2802 or equal.

C. Plastic Film: White pigmented, 0.00085-inches (minimum) thick.

D. Burlap: jute fabric, lean, free of impurities.

E. Surface Hardener: gray crystal, acidic fluosilicate base, slightly hygroscopic chemical surface hardener, SIKA Hardener, SIKA Chemical Corporation, or equal.

2.09 JOINT MATERIALS

A. Joint Sealer: hot poured, non-extruding, elastic, ASTM D1190.

B. Preformed Expansion Joint Filler: non-extruding, bituminous fiber, ASTM D1751.

2.10 WATERSTOP

A. Polyvinyl chloride or rubber, centerbulb.

B. Size to suit joinings, minimum 6-inches.

2.11 FORM MATERIALS

A. Use plywood, metal, metal framed plywood faced or other acceptable panel-type material.

B. Coat forms with non-bonding, non-staining commercial compounds

2.12 MOISTURE BARRIER

A. Polyethylene sheet, minimum 8-mil., ASTM E154.

2.13 CONCRETE MIX DESIGN AND CONTROL

A. Submit not less than 10 days prior to the start of concreting operations to the Engineer:

1. Mix design, using a coarse aggregate factor acceptable to the Engineer.
2. Sufficient samples of all materials to be incorporated into the mix for testing.
3. Full description of the source of supply of each material component.

B. Coarse aggregate factor:

1. Not more than 0.82 when voids less than 48%.
2. Not more than 0.85 when voids exceed 48%.
3. Not less than 0.68.

C. No changes or deviations from proportions or sources of supply without approval of Engineer.

D. No concrete may be placed on the job site until the mix design has been approved by Engineer in writing to the Contractor.

2.14 CONCRETE QUALITY

A. Consistency:

1. Mortar shall cling to the coarse aggregate.
2. The aggregate shall not segregate during transport.
3. The concrete and mortar shall show no free water when removed from the mixer.

B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.

C. The concrete shall be uniform, workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.

D. Excessive bleeding shall be avoided.

E. Slump requirements shall be as follows:

Structural Concrete	Average Slump	Maximum Slump
1. Cased Drilled Shafts and Thin-walled Sections (9-inches or less)	4	5
2. Slabs, Caps, Columns, Piers, wall sections over 9-inches. etc.	3	4
3. Slip Form Paving	1/2	2
4. Underwater or Seal Concrete	5	6
5. Rip-rap, Curb, Gutter and other Miscellaneous Surfaces	As Specified By Owner	As Specified By Owner

NOTE: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

Class Of Concrete	Minimum Maximum SX Cement Per CY	Minimum Comp. Strength 28-day PSI	Beam Strength 7-day psi	Minimum Water Item 2.1.1 ****	Maximum Aggregate Cement (c)(4)	Coarse Number
A	5.0	3000		500	6.5	2-3-4
B	4.0	2000		330	8.0	2-3-4
C*	6.0	3600		600	6.0	1-2-3**
D	3.0	1500		250	11.0	2-3-4
E	6.0	3000		500	7.0	2-3
F	6.5	4200		700	5.5	2-3
H***	6.5 - 8.0	ASP	NA	5.5	3	

ASP = As Specified on Plans.
*Entrained Air.
**No. 1 coarse aggregate may be used in foundations only (Except cased drilled shafts).
***Prestressed Concrete.
****ASTI C293 (Center Point).

2.15 GROUT

A. Non-Shrink:

1. Use premixed non-shrink, Embeco Pre-Mixed Grout or Embeco Pre-Mixed Mortar by Master Builders Company or equal.
2. Keep water to a minimum for placing by the dry packing method.

PART 3 - EXECUTION

3.01 SUBGRADE

A. Insure subgrade is true to line and grade and compacted as specified.

B. Fill and recompact any ruts or depressions.

C. Check cross section with a template.

D. Place moisture barrier or moisten subgrade prior to placing of concrete. Method to be approved by Engineer.

3.02 FORMS

A. Provide forms for all concrete work, including footings and base slabs.

B. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required.

C. Forms shall be true, plumb and level with reasonably tight joints. Adequately support and brace forms.

D. Place anchors, inserts, blots, sleeves and other devices indicated or required for the various portions of all the work.

E. Oil temporary forms with non-staining form oil before reinforcing steel is placed.

F. Rough form finish as defined by ACI 301 permitted for concealed concrete.

G. Smooth form finish as defined by ACI 301 permitted for concealed concrete.

H. Provide 3/4 inch chamfer on exposed corners and edges, and 1-foot below ground level.

3.03 REMOVAL OF FORMS

A. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the superimposed loads.

B. Remove formwork for columns, walls, beam sides and other parts not supporting the weight of the concrete as soon as the concrete has hardened sufficiently to resist damage from removal operations.

C. Formwork for slabs, beam soffits and other parts supporting the weight of the concrete shall remain in place until the concrete has reached its specified 28-day strength.

D. Protect concrete from damage prior to acceptance.

E. Prohibit traffic until concrete is at least 10 days old.

F. Cure areas previously covered by forms.

3.04 MIXING CONCRETE

A. Maintain all equipment, tools, and machinery used for hauling materials and performing any part of the work to insure completion of the work underway without excessive delays for repairs or replacement.

B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.

C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.

D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.

E. The entire contents of the drum shall be discharged before any materials are placed.

F. Improperly mixed concrete will not be placed.

G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.

H. Transit Mix Concrete:

1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
3. Concrete shall not be placed on the job after a period of 1 hour after the cement has been placed in the mixer, with mixer turning; 30 minutes without turning.

I. Continuous Volumetric Mix Concrete:

1. A mobile, continuous, volumetric mixer of the rotating puddle type may be used for when approved by Engineer.
2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mixed to the required consistency before discharging.
3. The mixers shall have adequate water supply and metering devices.
4. Calibration of these mixers will be required.

3.05 PLACING CONCRETE

A. The minimum temperature of all concrete at the time of placement shall not be less than 50°F.

B. Clean transporting equipment, reinforcing and embedded items before placing concrete.

C. Batch trucks or paving equipment not permitted on prepared subgrade unless authorized by the Engineer based on actual job conditions.

D. Place no concrete until after inspection of forms by Engineer.

E. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

Air or Concrete Temperature	Non-Agitated Concrete	Maximum Time
80°F or Above	26.6°C	15 minutes
35 to 79°F	1.6 to 26.1°C	30 minutes

Air or Concrete Temperature	Agitated Concrete	Maximum Time
90°F or Above	32.2°C	45 minutes
75 to 89°F	23.9 to 31.6°C	60 minutes
35 to 74°F	1.6 to 23.3°C	90 minutes

F. Prevent segregation during placing.

G. Consolidate flat work with one pass of mechanical vibrator moving parallel to centerline. Unusual section and widths may be hand puddled and finished.

H. Place concrete continuously so that each pour unit will be monolithic in construction and will terminate at expansion, contraction or construction joint. Permit not more than 30 minutes between depositing adjacent batches.

I. Place slab concrete over membrane before the waterproofing membrane becomes damaged or dirty.

J. Concrete placement will not be permitted when impending weather conditions will impair the quality of the work.

K. Slope horizontal surfaces of exterior concrete for drainage.

L. Deposit concrete in forms in horizontal layers not deeper than 24 inches. Avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.

M. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

N. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate placed layer of concrete and at least 6-inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. Limit vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.06 PLACING CONCRETE IN WATER

A. Concrete shall be deposited in water only when specified on the plans or with written permission of the Engineer.

B. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is deposited.

C. Pump will not be permitted during the concrete placing, nor until it has set for at least 36 hours.

D. The concrete shall be placed with a tremie, closed bottom-dump bucket or other approved method.

E. The concrete shall not be allowed to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement.

F. The tremie shall consist of a water-tight tube 14-inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. The lower end of the tremie shall be submerged in the concrete at all times.

G. Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.

H. The placing operations shall be continuous until the work is complete.

I. Unless otherwise specified, all concrete placed under water, except seal concrete, shall contain an additional sack of cement per cubic yard.

3.07 JOINTS

A. Type ‘A’ (Contraction) Joints:

1. Extend entirely across flat slabs at locations shown.
2. Where location is not shown, maximum spacing is:
    a. Driveways: 10-feet.
    b. Sidewalks: 4-feet.
    c. Other flat slabs: 20 times slab thickness.
3. Saw depth not less than 1/4 slab thickness.

B. Type ‘B’ (Isolation) Joint:

1. Install where shown on the plans.
2. Where location is not shown, place between all structures and features which project through, into or against slab.
3. Install according to manufacturer's recommendations. Set material securely before placing concrete.
4. Install 1/2-inch width unless shown otherwise.

C. Filling Joints:

1. Fill no later than 14 days after sawing.
2. Fill immediately following cleaning.
3. Fill to 1/8-inch of surface.

4. Remove excess while material is still pliable.
5. Refill low areas where necessary.
6. Omit filling sidewalk joints.

3.08 FINISHING EXTERIOR FLAT WORK

A. Strike off and float as required.

B. Check surface with ten foot straight edge, maximum variance allowed is 1/8-inch.

C. Drag concrete surface longitudinally with double thickness burlap drag after completion of straight edging unless noted otherwise.

D. Use edger on edges of slab.

E. Use hand finishing only when approved by Engineer.

3.09 FINISHING OTHER CONCRETE

A. Interior floors: smooth, steel-troweled finish. Use edger on exposed edges. Grind smooth defects which would telegraph through applied finish flooring.

B. Exterior walks and steps: lightly broomed finish transverse to traffic flow. Use edger on exposed edges.

C. Other surfaces:

1. Remove fins, projections and loose material.
2. Clean surfaces of form oil.
3. Patch honeycomb, aggregate pockets, voids and holes as follows:
    a. Chip out until sound concrete is exposed to minimum depth of 1-inch .
    b. Prepare patching mortar with approximately two parts of normal Portland Cement, one part white cement, nine parts fine aggregate; vary proportions of aggregate as necessary to match color of adjacent concrete.
4. Fill holes left by form ties to within 1 inch of surface with non-shrink grout. Fill remainder with patching mortar specified hereinbefore.
5. Apply grout-cleaned finish to all exposed vertical surfaces. Wet surface and rub grout on surfaces with rubber or cork float. Scrape off excess grout and finish with brick rubbing or as approved by Engineer.

D. Coordinate required finish with Engineer.

3.10 CURING

A. Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide proper equipment and in adequate amounts; and shall have approval of the proposed method, equipment and materials prior to placing concrete.

B. All concrete shall be cured for a period of 4 days except as noted herein.

1. Exceptions to 4-day Curing.
    a. Upper surfaces of Bridge Roadways, Median and Sidewalk Slabs, and

Top Slabs of Direct Traffic Culverts require 8 curing days.

b. A curing day is defined as a calendar day when the ambient temperature, taken in the shade away from artificial heat, is above 50° F(10°C) for at least 19 hours. If the ambient temperature is 50° F or less, a curing day is accepted only if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40° Fahrenheit (4.4°C) for the entire 24 hours.

C. Form Curing:

1. When forms are left in contact with the concrete, other curing methods shall not be required except for cold-weather protection.

D. Water Curing:

1. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet requirements for concrete mixing water.
    a. Wet Mat:
        (1) Cotton mats shall be used for this curing method. The mats shall not be placed in contact with the concrete until such time that damage shall not occur to the surfaces.
        (2) Damp burlap blankets made from 9-ounce stock may be placed upon the damp concrete surface for temporary protection prior to the application of the cotton mats.
        (3) The mats may be placed by and wetted down after placement.
        (4) Mat curing, except for continuous placements, shall commence not later than three hours after finishing of the roadway slab.
    (b) The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible.
        (6) The surfaces of the concrete shall be kept wet for the required curing time.
        (7) Surfaces which cannot be cured by contact shall be enclosed with mats, anchored positively to the forms, or to the ground, so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.
    b. Water spray:
        (1) This method shall be accomplished by overlapping sprays or sprinklers, so that all unformed surfaces are kept continuously wet.
    c. Ponding:

        (1) This method requires the covering of the surface with a minimum of two inches (5 cm) of clean granular material, kept wet at all times; or water to a minimum depth of one inch (2.5 cm). Satisfactory provisions shall be made to provide a dam to retain the granular material or water.

E. Membrane Curing

1. Unless otherwise shown on the plans, Type 2 membrane curing compound may be used where permitted.
2. A membrane shall be applied in a single, uniform coating at the rate of

coverage recommended by the manufacturer and as approved by the Engineer, but not less than nine gallons per 210 feet (.0038M^3 63M) of area. Tests for acceptance shall be at this specified rate.

3. Membrane curing shall not be applied to dry surfaces; but shall be applied to horizontal surfaces just before free moisture has disappeared.
4. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.

	REQUIRED		**PERMITTED**	
Structure Unit Description	Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for Interim Curing
Upper surfaces of bridge roadway; median *and* sidewalk slabs; top slabs of direct traffic culverts; top surface of any concrete unit upon which concrete is to be placed and bonded at a later interval (stub walls risers, etc.) Other super-structure concrete (curbs, wing-walls, parapet walls, etc.)	X	X		Resin Basin
Top surface of precast and/or prestressed piling	X	X		
All substructure con-crete culverts box sewers inlets man-holes retaining walls riprap	X	X		

*Polyethylene sheeting or burlap polyethylene mats fastened to prevent outside air from entering into the concrete shall be considered equivalent to water or membrane curing per this item.

5. When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane which is damaged shall be corrected immediately by reapplication of membrane.

3.11 TESTING

A. Furnish at least five cylinders or beams from each 50 cubic yard, or portion thereof for test purposes unless otherwise directed by Engineer. Test two cylinder at 7 days, test two cylinders at 28 days and test final cylinder only if needed for confirmation of compression strength.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling-in: fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Use non-shrink grout as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Equipment bases and foundations: provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment. Use non-shrink grout as shown on plans.

E. Steel pan stairs: provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screen, tamp and finish concrete surfaces as scheduled.

F. Reinforced masonry: provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Cast-in-place concrete for the work shown on the plans shall be measured by the cubic yard as specified in the pans and contract.

4.02 PAYMENT

A. The accepted quantities of cast-in-place concrete shall be paid for at the unit bid price per cubic yard.

B. The unit bid price shall be full compensation for furnishing, hauling, and mixing all concrete materials, including trial batches; placing curing and finishing all concrete; for all grouting and joints; furnishing and placing all expansion and construction joints, except as provided in the plans; furnishing and placing metal flashing strips and waterstops; and for all forms and false-work, labor tools, equipment and incidentals necessary to complete the work.

C. The preceding provisions for payment shall not be interpreted to provide payment of concrete in railing, piling, precast, prestressed concrete units or other concrete items of which provision is otherwise made in the contract.

END OF SECTION

SECTION 03300 − CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior and exterior plain and reinforced site-placed concrete, vapor retarders, expansion joints, curing compounds and other related accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Masonry Wall Dowels.

1.3 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement

B. Section 04220 – Concrete Masonry Units

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. 301, Structural Concrete.
2. 302, Guide for Concrete Floor and Slab Construction.
3. 304, Measuring, Mixing, Transporting and Placing Concrete.
4. 305R, Hot Weather Concreting.
5. 308, Curing Concrete.
6. 309, Recommended Practice for Consolidation of Concrete.
7. 318, Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM):

1. C31, Making and Curing Concrete Test Specimens in the Field.
2. C33, Concrete Aggregates.
3. C39, Compressive Strength of Cylindrical Concrete Specimens.
4. C94, Ready Mixed Concrete.
5. C143, Test Method for Slump of Portland Cement Concrete.
6. C150, Portland Cement.
7. C171, Sheet Materials for Curing Concrete.
8. C172, Sampling Freshly Mixed Concrete.
9. C231, Air Content of Freshly Mixed Concrete by the Pressure Method.
10. C260, Air Entraining Admixtures for Concrete.
11. C309, Liquid Membrane - Forming Compounds for Curing Concrete.
12. C494, Chemical Admixtures for Concrete.
13. C618, Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.5 DEFINITIONS

A. Concealed: For Work required under this Section, the term "concealed" will mean "not exposed to view in finished construction."

B. Exposed: For Work required under this Section, the term "exposed" will mean "exposed to view in finished construction."

1.6 SUBMITTALS

A. Submit: Provide electronic (PDF) copies of all required submittal information.

1. Concrete mix designs. Follow ACI 301. Submit a mix design for each class of concrete required within 30 days after Contract date and prior to placing any concrete.
2. Product data including installation requirements for curing/sealer compounds, mineral and chemical admixtures and joint devices.
3. Concrete delivery tickets.

    a. Submit to Owner's Engineer at Site.
    b. Follow ASTM C94. Also include:

        1) Batch number.
        2) Mix by class of concrete and bag content with maximum aggregate size used
        3) Air content.
        4) Quantities and types of admixtures.
        5) Slump.
        6) Time of loading.

    c. Delivery tickets not showing time of loading will be grounds for rejection of load.

4. Testing laboratory reports.

    a. Submit directly to Owner's Engineer, Contractor and ready-mix supplier.

5. Certification or test results indicating compliance of material or source of material with these specifications (upon request).

1.7 QUALITY ASSURANCE

A. Maintain 1 copy of each referenced document at Site.

B. Acquire cement and aggregate from same source for all Work.

C. Tolerances: Place and finish cast-in-place concrete within tolerance limits specified in ACI 301 and as follows:

1. Formed Surfaces: Follow ACI 301 (Table 4.3.1.)

D. Acceptance of Work: Presence or evidence of nonconforming Work shall be sufficient cause for Owner's Engineer to require entire section of concrete affected be torn out and rebuilt properly at Contractor's expense.

1. Such unacceptable Work includes:

    a. Horizontal or vertical misalignment.
    b. Cracking.
    c. Honeycombing.
    d. Spalling.
    e. Embedded debris.

2. If by tests or on-site observation, Owner's Engineer determines that any of Contract requirements have not been fully met in completion of this Work, he may require additional testing or retesting to determine composition, soundness and actual structural capacity of any concrete.
3. Costs for such testing shall be paid by Contractor if such tests subsequently establish that Work is unacceptable and by Owner if Work is found to be acceptable.
4. Remove and replace all unacceptable Work including related Work which was acceptable but which must be disturbed as a result of replacement if such tests establish that Work is unacceptable with regard to compliance with these specifications.

1.8 DELIVERY, STORAGE AND HANDLING

A. Concrete Delivery: Follow ACI 304 and ASTM C94.

B. Deliver packaged materials in manufacturer's unopened, labeled containers.

C. Store materials to provide protection from weather and damage.

D. Deliver concrete in agitating or revolving type equipment. DO NOT USE NON-AGITATING EQUIPMENT.

E. Discharge concrete at Site within 1-1/2 hours or 300 revolutions, whichever comes first, after water has been added to cement and aggregates or cement batches with aggregates unless a longer time is specifically authorized by Owner's Engineer.

F. Owner's Engineer may require a reduction in this elapsed time during hot weather, when high early strength cement is being used or under other conditions contributing to quick stiffening of concrete.

1.9 PROJECT CONDITIONS

A. Coordinate Work of other trades who will furnish and install items of Work (sleeves, piping, conduit, inserts, etc.) to be cast in concrete. Place no concrete until such items are in place.

B. Place concrete at ambient temperatures between 50°F and 95°F.

C. Follow instructions for special procedures at end of this Section should it be necessary to place concrete in colder or hotter weather.

D. Protect freshly placed concrete from rainfall, water leaks, falling objects, traffic of any kind and other hazards to surfaces. Provide barricades and lights if necessary.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement:

1. ASTM C150 Type II (Moderate).
2. Cement shall be free of false set when tested following ASTM C451.
3. Use same brand, type and source throughout.

B. Aggregates:

1. Fine Aggregate: ASTM C33; natural or manufactured sand, clean, hard and durable, uncoated grains, free from deleterious matter. Average fineness modulus shall be between 2.5 and 3.0.
2. Coarse Aggregate: ACI 301 and ASTM C33.

a. Interior and Concealed Exterior Applications: Crushed gravel or stone, durable uncoated particles free from deleterious matter.
b. Exposed Exterior Applications: Crushed dolomite, granite or limestone.
c. Grading: ASTM C33 No. 57. Exception: Use grade size No. 8 masonry core fill.

C. Admixtures:

1. Mineral Admixtures:

a. Fly Ash: ASTM C618 Class C or Class F; maximum 25% fly ash may be used as a cement substitute; maximum 6% loss on ignition.
b. Fly ash source must be approved by Owner's Engineer. Preapproved sources are:

1) Class C: Boral Manufacturing

2. Chemical Admixtures:

a. Air Entraining Admixtures: ASTM C260.
b. Water Reducing Admixtures: ASTM C494 Type A (Water Reducing).

1) Type E (Water Reducing and Accelerating) may be used during cold weather and Type D (Water Reducing and Retarding) during hot weather with Engineer's prior approval.
2) Type F (Water Reducing - High Range) or Type G (Water Reducing High Range and Retarding) admixtures (superplasticizers) may used be used with Engineer's prior approval.

c. Calcium chloride, thiocyanates, corrosive admixtures or admixtures containing more than 0.05% chloride ions (total) are not permitted.

3. DO NOT USE ANY OTHER ADMIXTURES WITHOUT AEPSC'S PRIOR WRITTEN APPROVAL.

D. Water: Potable; free from objectionable quantities of foreign materials harmful to concrete such as silt, organic matter, acids, alkali, salt and other deleterious substances.

E. Vapor Retarders: Clear or black fungus resistant polyethylene or fabric reinforced plastic film recommended for below grade application; 10 mil thick. The vapor retarder should be installed according to ASTM E1643, "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs."

F. Expansion Joint Filler Strips: ASTM D1751 non-extruding and resilient type, asphalt impregnated fiberboard or felt or ASTM D1752 closed cell foam with resiliency recovery of 95% if not compressed more than 50% of original thickness; 3/8" thick for interior and 1/2" thick for exterior unless shown otherwise.

G. Liquid Curing/Sealer Compound (Typical): ASTM C309 Type 1; approved by Asphalt and Vinyl Composition Tile Institute; 30% minimum solids content.

H. Sheet Curing Membranes: ASTM C171; absorptive mats, waterproof paper or polyethylene film.

2.2 CONCRETE MIXES

A. General Requirements:

1. Concrete Mixing: Follow ASTM C94. BATCH MIXING OF CONCRETE ON SITE IS NOT PERMITTED EXCEPT FOR MISCELLANEOUS MIXES.
2. Mixing Procedures: Follow ACI 301.
3. Handling and Weighing: Follow ACI 304.

4. Measure water, air entraining admixtures and water reducing admixtures by weight or volume. Measure all other materials by weight.
5. Provide admixtures for entrainment in concrete Work subject to vehicle abrasion or freeze - thaw cycles either during construction or afterwards. AIR ENTRAINED CEMENT IS NOT ACCEPTABLE.
6. Provide water reducing admixtures in all Classes of concrete Work.
7. No dry-packaged mixtures are allowed.
8. Provide fly ash as supplementary cementitious material in concrete Work. Fly ash content shall not exceed 25% of the cementitious material weight within a concrete batch.
9. Exposed concrete is to meet requirements for potentially destructive exposure.
10. Admixtures are to be added at batch plant.
11. Do not add water to mix on job unless previously approved by Owner's Engineer. Note amount of water added on delivery ticket.
12. Nominal maximum allowable slump of concrete (except for controlled density fill) is 4".
13. Follow Exhibit 03 30 00 for water/cementitious ratio of concrete.
14. Provide minimum 3 day compressive strength of 1800 psi for concrete used for floors.

B. Concrete Properties and Proportions:

1. Provide concrete meeting the following properties and performance specifications

a. Cast-In-Place Concrete (Class 1)

F'c	3,000 psi (28-day compressive strength)
Portland Cement	ASTM C 150 Type II
Fly Ash	ASTM C 618 Class C (Maximum of 25% of cementitous material)
Water/Cementitious Material Ratio	0.60 Maximum
Slump	5" (+/- 1") measured from the discharge of the truck
Coarse Aggregate	1" maximum with gradation requirements prescribed in Table 2 of ASTM C33 Size No. 57
Air Entrainment	Air entrainment shall not be used for concrete with exposed steel troweled surfaces
Total Air Content	3% Maximum (by volume)
Concrete Temperature	95ºF Maximum

b. Masonry Grout Fill (Class 2)

F'c	3,000 psi (28-day compressive strength)
Portland Cement	ASTM C 150 Type II
Fly Ash	ASTM C 618 Class C (Maximum of 25% of cementitous material)
Slump	8" to 11" measured from the discharge of the truck
Coarse Aggregate	3/8" maximum with gradation requirements prescribed in Table 2 of ASTM C33 Size No. 8

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Site conditions and excavations for earth forms to verify that they are neatly and accurately cut and correctly located.

B. Examine formwork to verify that it is sound and correctly located, that conditions are proper for concrete installation and that excavations are sufficient to permit placement, inspection and removal of forms.

C. Examine reinforcement to verify requirements for concrete cover.

D. Examine areas of Work to be cast to determine that substrates are properly installed, required reinforcement, inserts and embedded items are in place and that correct finish top of cast elevations can be obtained.

1. Verify that conduit and piping is installed below slab. NO UTILITIES ARE TO BE BUILT INTO SLAB OR TOPPING.
2. Verify depths of depressed conditions are correct for specified delayed finishes. Slabs to receive finishes over 1/8" in thickness shall be depressed as required to allow for alignment with adjacent finish materials.
3. Verify base and sub-base slope correctly at floor drains. Slab thickness shall be maintained in sloped areas.

E. Do not start Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ensure availability of sufficient labor, equipment and materials to place concrete correctly following Project requirements and scheduled casting.

B. Notify Owner's Engineer at least 48 hours in advance of placing any concrete. Place concrete only when Owner's Engineer is present unless this requirement is specifically waived. Excavations must be inspected and approved by soils engineer.

C. Place no concrete before embedded items are in place and before forms, reinforcing and affected Work of other trades have been examined.

1. Coordinate placement of joint devices with erection of formwork and placement of form accessories.

D. Drill holes in previously poured concrete, insert steel dowels and pack solid with non-shrink grout in locations where new concrete is dowelled to existing Work including at bases and pads.

E. Immediately Before Placing Concrete:

1. Clean debris from forms, decks, base slabs, bottoms of forms, etc. to receive concrete.
2. Thoroughly wet base of slabs poured directly on earth, sand, stone, concrete or gravel.
3. Verify sizes and locations of openings required.
4. Secure approval of conditions from Owner's Engineer. Allow a minimum of 1 hour for Owner's Engineer's inspection after installation of reinforcing and before placing concrete.

3.3 ERECTION / INSTALLATION /APPLICATION

A. Follow ACI 301.

B. Place concrete only when Owner's Engineer is present unless this requirement is specifically waived by Owner's Engineer upon notice of scheduled pour.

C. Notify Owner's Engineer not less than 48 hours (excluding holidays and weekends) in advance of placing concrete.

D. Provide concrete of following various classes unless shown otherwise.

1. Class 1: Cast-In-Place Concrete
2. Class 2: Masonry Grout Fill

E. Provide uniform slope at rate shown on structural foundation plans. Exterior walkways shall slope as indicated on Architectural plans.

F. Install vapor retarder under interior and exterior slabs, walks, bases and pads on grade.

1. Lay film directly on slab base just before setting reinforcing and pouring concrete slabs. Provide widest widths practical and oriented to obtain least lineal footage of joint.
2. Lap and seal joints. Lap film a minimum of 6" at joints with top lap placed in direction of spreading of concrete. Seal joints watertight by taping or applying sealant at overlapping edges and ends.
3. Carry film up walls, columns, etc. and secure in place with cement or tape. Fold and cement corners or otherwise make vaporproof.
4. Provide sealed contact with piping and other penetrating items. Cut film carefully around opening for pipes, ducts, conduit, wiring, etc. Tape film to insure maximum barrier effectiveness.
5. Exercise care so that film is not punctured. Seal joints, cuts, punctures, etc. with tape, cement or hot iron.
6. Trim exposed film at floor line after concrete has cured and hardened.
7. Repair vapor retarder damaged during placement of concrete reinforcing.

G. Provide sufficient workmen to allow for placement of concrete and other operations within time limits required in Article 1.07 herein.

H. Keep delivery carts and buggies on runways. Do not allow them to bear on reinforcing or uncured concrete.

I. Deposit concrete within 6 feet of its final location to avoid segregation due to rehandling or flowing. Do not drop concrete freely where reinforcing will cause segregation. Chuting procedure is subject to approval of Owner's Engineer. Maximum allowable drop is 5 feet. SPREADING WITH VIBRATORS IS PROHIBITED.

J. Place concrete quickly and vibrate thoroughly with a vibratory screed or other device approved by Owner's Engineer. Maintain specified position of mesh and reinforcement. Follow ACI 309 for use and type of vibrators.

K. Deposit concrete continuously, or when continuous placement is not possible, provide construction joints at locations approved by Owner's Engineer.

L. Do not deposit partially set concrete, retempered concrete or any concrete failing slump or air content tests.

M. Consolidate concrete by internal vibration to maximum practical density so that it is free from pockets of coarse aggregate and trapped air, fits tightly against subgrades, forms and embedded items and leaves smooth, dense surfaces.

N. Operate vibrators using experienced workers and where possible use same operators throughout Project. DO NOT USE VIBRATORS AGAINST FORMS OR REINFORCEMENT.

O. Finishes: Follow ACI 301 (Chapter 11). Perform finishing using only experienced, skilled workers.

1. Flatwork:

a. Slab finish shall be as noted on structural foundation plans. Reference structural general notes for flatness requirements pertaining to surface finish.
b. Detectable Warning Finish: For exterior handicapped curb cuts (ramp only not on flared sides), textured or imprinted concrete using rollers or aluminum tools to produce 0.9" diameter x 0.2" high (nominal) truncated domes at 2.35" on center following requirements of Americans With Disabilities Act (ADA).

2. Vertical and Miscellaneous Work:

a. Exposed Surfaces: Smooth, Do Not Rub Cement Paste on Exposed Concrete Surfaces.
b. Concealed Surfaces: Rough form finish.

P. Control (Contraction) Joints:

1. General Requirements:

a. Provide joints in walks, pads, slabs and toppings shown or specified.
b. Make joints approximately 1/8" wide and minimum depth of 1/4 slab thickness.
c. Locate as shown or as follows if not shown. Verify final locations with Owner's Engineer before proceeding.

2. Interior Locations:

a. Provide sawed control joints where shown or at maximum 20 feet on center in each direction in slabs and toppings if not shown.
b. Install sawed joints immediately after final finishing to depth of 1/4 slab thickness with Soff-Cut saw.
c. Saw control joints 1/8" wide unless otherwise approved. A construction joint may be located where sawed joint is required.

Q. Curing and Protection: Follow ACI 308.

1. Prevent excessive moisture loss from formed surfaces. Cure formed surfaces by moist-curing or application of curing compound for remainder of curing period if forms are removed before 7 days have elapsed.
2. Provide 1 application of liquid curing/sealer compound immediately after finishing of concrete on interior and exterior concrete slabs.

a. Exception #1: Floors scheduled to receive ceramic tile and quarry tile shall be sheet membrane/water (moist) cured for minimum of 10 days.

1) Begin water curing as soon as concrete has hardened sufficiently to prevent damage from water or cover material.
2) Water curing shall consist of ponding or with sprinkling, spraying or covering with wet burlap, sand or waterproof barrier such as polyethylene or building paper.
3) Maintain 100% coverage continuously over water cured slabs for minimum of 4 days for ponding and for 7 days for spraying and membrane curing.

3.4 FIELD QUALITY CONTROL

A. Test and inspect materials and operations as Work progresses. Failure to detect defective Work shall not prevent rejection when defect is discovered nor shall it obligate Owner for final acceptance.

B. Costs for any retesting resulting from Work found to be in non-compliance shall be paid for by Contractor.

C. Strength: ASTM C31, C39 and C172.

1. Conduct strength tests of all classes of concrete (except miscellaneous mixes).
2. Secure composite samples following ASTM C172. For strength tests, a sample shall be obtained from same batch of concrete on a representative, random basis. A sample consists of six specimens.
3. Mold and cure each sample following ASTM C31.
4. Test 1 specimen at 7 days, test 2 specimens at 28 days and 1 specimen at 56 days following ASTM C39. Results shall be average of strengths of 2 specimens, except that if 1 specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded.
5. Record exact location of Work represented by each sample on test reports.
6. Provide a sample for each amount or fraction thereof of each class of concrete placed each day as follows:

a. 0-100 Cubic Yards: 1 Sampling of 4 Cylinders.

D. Air Content: ASTM C231.

E. Slump: ASTM C143.

3.5 ADJUSTING AND CLEANING

A. Provide materials, methods and finishes for cleaning, patching and other repairs consistent with similar concrete Work in place, approved by Owner's Engineer before beginning repair Work and performed at Contractor's expense.

B. Repair any slabs which do not meet finish requirements performing all grinding, filling of cracks or patching and leveling procedures as required. Replace slabs which cannot be successfully repaired.

C. Point carefully around piping, conduit and other penetrations on both interior and exterior surfaces.

D. Obtain Owner's Engineer prior approval of any corrective measures for slabs which are dusting or showing other signs of improper curing. These may include additional applications of sealer or hardener, grinding or covering with coating or topping.

E. Remove from interior and exterior exposed surfaces any stain-producing elements such as pyrites, nails, wire, reinforcing steel and form ties immediately prior to final acceptance.

F. Remove stains completely. Use of weak acids or patented cleaners is acceptable but surface is to be completely neutralized after use.

G. Blend in surfaces of exposed repairs inconspicuously with surrounding surfaces.

3.6 PROTECTION

A. Protect newly placed concrete from weather and construction traffic damage.

3.7 SPECIAL PROCEDURES

A. It is Project intent to continue concrete Work required to keep Project on schedule throughout summer and winter.

B. Hot Weather Concreting:

1. Follow ACI 305R.
2. Obtain approval to use a retarder in concrete.
3. Temperature of concrete shall not exceed 95ºF.
4. Cool water and aggregate to lower temperature of concrete.
5. Cool subgrade and forms by sprinklering with water immediately before placing.
6. Schedule trucks to reduce waiting time at Site.
7. Cure immediately after finishing.

C. Replace any concrete injured or destroyed by reason of freezing, hot or cold weather at Contractor's own expense including cost of replacing any Work embedded in concrete.

END OF SECTION 03300

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

The extent of each type of masonry work is indicated on drawings and schedule.

QUALITY ASSURANCE:

Field Constructed Mock Ups: Prior to installation of masonry work, erect sample wall representative of completed masonry work required for project with respect to qualities of appearance, materials and construction. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect. Retain mock-ups during construction as standard for judging completed masonry work. For the following types of masonry, build mock-ups which are approximately 4' long by 4' high by full thickness including back-up wythes, if any. When directed, demolish mock-up and remove from site.

Mockup should include each type of exposed unit masonry work.

SUBMITTALS:

Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.

Samples: Submit, for verification purposes, samples of each exposed masonry unit and colored masonry mortar, if any. Include in each set of samples the full range of exposed colors and textures to be expected in completed work.

JOB CONDITIONS:
Protection of Work: During erection, cover top of walls with heavy waterproof sheets at end of each days' work. Cover partially completed structures when work is not in progress.

Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.

Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

Protect sills, ledges and projections from droppings of mortar.

Cold Weather Protection:

Do not lay masonry units which are wet or frozen or when temperature is 45 Degrees F and falling.

Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry temperature ranges apply to anticipated minimum night temperatures.

40 F (4 deg. C) to 32 deg. F (0 deg. C):

Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

32 F (0 deg. C) to 20 deg. F (-7 deg. C):

Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

20 deg. F (-7 deg. C) and below:

Except as otherwise indicated, maintain masonry temperature above 32 F (0 deg) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 deg. F (4 deg. C) for 48 hours.

PART 2 - PRODUCTS

MASONRY UNITS, GENERAL:
Manufacturer, obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas. All units shall be made in the USA.

Masonry Unit Characteristics: Provide units complying with standards referenced and requirements indicated.

Manufacturer, obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas. All units shall be made in the USA.

Masonry Unit Characteristics: Provide units complying with standards referenced and requirements indicated.

CONCRETE MASONRY UNITS (CMU):

Size: U. S. Made. Manufacturer's standard units with nominal face dimensions of 16" long x 8" (15-5/8" x 7-5/8" actual), unless otherwise indicated.

Special shapes: Provide where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions. Provide bullnose units for outside exposed corners, i.e., walls, windows, door jambs, sill, column and downspout covers.

First base course of concrete masonry unit shall not be bullnosed to allow for rubber base corner unit.

Hollow Load-Bearing (HL) CMU: ASTM C 90 where shown as "HL-CMU" and as follows:

Grade: "N"

Weight Classification: Lightweight units unless otherwise indicated. (125 lbs, per cu. ft. or more, oven dry weight of concrete). ASTM C 331, Type I, Grade N.

Cure units by autoclave treatment at a minimum temperature of 350 F (176 degrees C), and a minimum pressure of 125 psi.

Limit moisture absorption of 25% of saturation during delivery and until time of installation.

Cure unit in a moisture-controlled atmosphere or in an autoclave a normal pressure and temperature to comply with ASTM C 90, Type I.

Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U. S. Weather Bureau Station nearest the project site.

Exposed Faces: Smooth.

All units will be manufactured to include “Dry Block®” or Rain Block integral water repellant in accordance with ASTM E 514 or as required by drawings.

All units shall be manufactured with a chamfered edge to insure a straight break on the face shell of the unit.

ARCHITECTURAL MASONRY UNITS (CMU):

Basis of Design: Best Block Construction Materials, 2088 FM 949 Alleyton TX 78935
(713) 393-3395

Size: U. S. Made. Manufacturer's standard units with nominal face dimensions of 16" long x 4" (15-5/8" x 3-5/8" actual), unless otherwise indicated.

Exposed Faces: Ground
Color: (7) Burnt Umber

MORTAR MATERIALS:
Portland Cement: ASTM C 150, Type I. Provide natural color or as required to produce required mortar color.

MASONRY CEMENT: ASTM C91

Hydrated Lime: ASTM C 207, Type S.

Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

Aggregate for Grout: ASTM C 404.

Water: Clean and potable.

MASONRY ACCESSORIES:
Horizontal Joint Reinforcing and Ties for Masonry:

Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner ("L") and intersecting ("T") units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross rods, into units with widths of approximately 2" less than nominal width of walls and partitions as required to position side rods for full embedment in mortar with mortar coverage of not less than 5/8" on joint faces exposed to exterior and not less than 1/2" elsewhere. Provide the following type of joint reinforcing unless otherwise indicated.

Coated or corrosion-resistant metal meeting or exceeding applicable standard:

Zinc-coating flat metal: ASTM A153
Zinc-coating of wire: Hot Dipped Galvanized
Provide job fabricated corner sections for all type of reinforcement.

Types: Wire Mesh:
Minimum Gage: 20
Mesh: 1/2 inch
Galvanized Wire:
Width: 1 inch less than width of masonry

Wall Reinforcement:
Wire Gage: 9 gage (side and cross rods) cross rods not more than 16" o.c.
Types: Truss
Provide with "V" drip.

Multi-Wythe Wall Reinforcement:

Prefabricated welded joint reinforcement

Wire Gage: 9 gage (side and cross rods) cross rods not more than 16" o.c.
Types: Truss Trirod with "V" drop.

Wire Finish: Provide Hot Dipped galvanized finish except as otherwise indicated.

For exterior walls hot-dip galvanized joint reinforcing after fabrication to comply with ASTM A 153, Class B-2 coating (1.5 oz. per sq. ft.).

Where spacing and back-up joints do not align, provide either offset or adjustable 2-piece ties.

Individual Wire Ties for Masonry:
Fabricate from 3/16" cold-drawn steel wire, ASTM A82, unless otherwise indicated, of the length required for proper embedment in wythes of masonry.

Where spacing and back-up joints do not align, provide either offset or adjustable 2-piece ties.

For interior and exterior walls, fabricate from steel wire with mill galvanized finish. Use wire ties at all wall intersections.

Anchors and Ties:

Provide straps, bars, bolts and rods fabricated from 1/4" diameter rod stock, unless otherwise indicated. Paint all welds with red primer.

Flexible Anchors: Where masonry is indicated to be anchored to structural framework with flexible anchors, provide 2-piece anchors which will permit horizontal and vertical movement of masonry but will provide lateral restraint.

Adjustable Wire Anchors:

Wire Anchors: Wire 1/4" diameter - Weld to Structural Frame and paint welds
Triangular Wire Loop:

Wire: All wire to meet ASTM A82 for steel wire.

Triangular Wire Loops: Size as on drawings or as required by manufacturer for proper anchoring.

Anchoring:
Embed into face brick a minimum of 2 - 1/2".
Embed into bond beams and CMU a minimum of 4".
Weld wire bars to structural frames, and paint welds.

Adjustable wall reinforcement: (Multi-Wythe and Cavity Walls)

Wire gage: 9 gage (side and cross rods) cross rods not more than 16 o.c.
Type: Truss
Provide “V” drip for cavity walls.

For interior work, including devices which extend only into interior wythes of exterior masonry, fabricate from steel with mill galvanized.

For devices which extend into exterior wythe, fabricate from steel with hot-dip galvanized coating, ASTM A 153, Class B-2.

Flashings for Masonry - Provide concealed flashing, shown to be built into masonry.
Provide concealed flashings as follows:
Virgin polyvinyl chloride with plasticizers and other modifiers, formed into uniform flexible sheets not less than 40-mils thick and black in color, unless otherwise indicated.

Henry – Blueskin TWF
Grace - Vycor

MISCELLANEOUS MASONRY ACCESSORIES:
Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No3" x 3" x "10. 3 to No. 18.

Bond Breaker Strips: 15-lb. Asphalt roofing felt complying with
ASTM D 226, or 15-lb, coal-tar roofing felt complying with ASTM D 227.

Pre-molded Control Joint Strips: Solid rubber strips with a Shore A durometer hardness of 60 to 80, designed to fit standard sash block and maintain lateral stability in masonry wall; size and configuration as indicated.

Plastic Weep holes: Unless otherwise indicated, provide 1/4" round X 4" long medium density polyethylene plastic tubes to form weep holes, 24" o.c. cotton sash rope may also be used.

MORTAR AND GROUT MIXES:
Do not lower the freezing point of mortar by use of admixtures or
anti-freeze agents.

Masonry Cement - Must comply with ASTM C91.

Mortar for Unit Masonry: Comply with ASTM C 270, Proportion
Specification, for types of mortar required, unless otherwise indicated.

Use Type S mortar for reinforced masonry and where indicated.

Use Type N mortar for exterior, above grade load bearing and non-load bearing walls; for interior load bearing walls; and for other applications where another type is not indicated.

Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.

PART 3 - EXECUTION

INSTALLATION, GENERAL:
Thickness: Build masonry construction to the full thickness shown, except, and build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Build chases and recesses as shown and as required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent

chases and recesses.

Cut masonry units with motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting where possible. Use dry cutting saws to cut concrete masonry units.

Chipped block shall not be used where visible.

Do not wet concrete masonry units.

Pattern Bond: Lay exposed masonry in the bond pattern shown, or if not on, lay in running bond vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe bonded by lapping not less than 2". Bond and unlock each course of each wythe at corners, unless otherwise shown.

Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half size units at corners, jambs and wherever possible at other locations.

Lay-up walls plumb and with courses level, accurately spaced and coordinated with other work.

Lay-up walls: Lay up walls with the good side of the units towards the hallways or larger walls.

Stopping and Resuming Work: Rack back 1/2-masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

Fill space between hollow metal frames and masonry solidly with mortar.

Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

Fill CMU cores with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar conditions, unless otherwise indicated.

Intersecting Load bearing Walls: If carried up separately, block vertical joint with 8" maximum offsets and provide rigid steel anchors spaced not more than 4' - 0" o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2' - 0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/2" x 1/4" x 2' -0" long with ends turned up not less than 2" or with cross-pins. If used with hollow masonry units, embed ends in mortar filled cores.

Non-Load bearing Interior Partition Walls: Build full height of story to underside of solid structure above, unless otherwise indicated.

MORTAR BEDDING AND JOINTING:

Lay brick and solid concrete masonry units with completely filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head

joints.

Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" joints.

Cut joints flush for masonry walls which are to be concealed or to be covered by other materials.

Tool horizontal joints with a 2'-0" or 3'-0" sledge runner. All joints to be uniform.

Tool exposed joints slightly concave using a jointer larger than joint thickness. Tool horizontal joint with a 2' - 3' sledge runner, all joints shall be uniform. Rake out mortar in preparation for application of caulking or sealants where shown.

Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

CAVITY WALLS:
Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity, flush.

Tie exterior wythe to back with continuous horizontal joint reinforcing embedded in mortar joints at not more than 16" o.c. vertically.

Provide weep holes in exterior wythe of cavity, composite and veneer walls located immediately above ledges and flashing, spaced 2' -0 " o.c., unless otherwise indicated.

STRUCTURAL BONDING OF MULTI-WYTHE MASONRY:

Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie for 4 sq. ft. of wall area spaced not to exceed 24" o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 1' -0" of all openings and space not more than 3' -0" apart around perimeter of openings. At intersecting and abutting walls, provide ties at not more than 24" o.c. vertically.

Use continuous horizontal joint reinforcement embedded in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically as specified. Provide continuity at corners and intersections using prefabricated "L" and "T" units.

HORIZONTAL JOINT REINFORCING:
Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" at other locations. Lap reinforcement a minimum of 6".

Do not bridge control and expansion joints with reinforcing, unless otherwise indicated. Provide continuity at corners and wall intersections by use of job fabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

Space continuous horizontal reinforcement as follows:

For multi-wythe walls (solid or cavity) where continuous horizontal reinforcing acts as structural bond or tie between wythe, space reinforcing as required by code but not less than 16" o.c. vertically.

For single-wythe walls, space reinforcing at 16" o.c. vertically, unless otherwise indicated.

Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening, bridging control joints, where provided.

ANCHORING MASONRY WORK:

Provide anchor devices of type indicated. If not indicated, provide standard type for facing and back-up involved.

Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

Provide an open space not less than 1” in width between masonry and structural member, unless otherwise indicated.
Keep open space free of mortar or other rigid materials.

Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible ties sections, unless otherwise indicated.

Space anchors as indicated, but not more than 24” o.c. vertically and 36" o.c. horizontally.

Anchor single wythe masonry veneer to backing with metal ties as follows:

Anchor veneer to structural members with metal anchors embedded in masonry joints and attached to structure. Provide anchors with flexible tie section, unless otherwise indicated.

Space veneer anchors as shown, or if not shown, space not more than 16" o.c. vertically and 24" o.c. horizontally. Provide additional anchors within 1 - 0" of openings and space not more than 3 - 0" around perimeter.

LINTELS:
Install loose lintels of hot-dipped galvanized steel and other materials where shown.

Provide masonry lintels where shown and wherever openings of more than 1' 0" are shown

without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Thoroughly cure precast lintels before handling and installation. Temporarily support formed in place lintels.

For hollow concrete masonry unit walls, use specially formed "U" shaped lintel units with reinforcing bars placed as shown and filled with grout of consistency required to completely fill space between reinforcing bars and masonry unit.

Provide minimum bearing at each jamb, of 4" for openings less than 6' 0" wide, and 8" for wider openings.

CONTROL AND EXPANSION JOINTS:

Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related masonry accessory items as the masonry work progresses. Space joints a maximum of 20 feet (exterior walls) and 30 feet (interior walls) unless otherwise shown on Drawings.

See Division 7 Sections for "Joint Sealers".

Build in joint fillers where shown, specified in a Division 7 section "Joint Sealers". Joint width for sealants: 3/8" unless otherwise indicated.

FLASHING OF MASONRY WORK:

Provide concealed flashings in masonry work at, or above, all shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar.

Extend flashings the full length of lintels and shelf angles and minimum of 4” into masonry each end. Extend flashing from a line 1/2" in from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

Provide weep holes in the head joints of the same course of masonry bedded in the flashing mortar.

Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.

Install flashing in accordance with manufacturer's instructions.

Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

REPAIR, POINTING AND CLEANING:

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended.

Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of caulking or sealant compounds.

Clean exposed brick masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method. Comply with requirements of BIA Technical Notes No. 20 "Cleaning Brick Masonry."

Use commercial cleaning agents in accordance with manufacturer’s instructions.

Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Comply with recommendations in NCMA TECK Bulletin No. 28.

END OF SECTION 042000

SECTION 042200 - CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete masonry units, lintels, mortar and other related accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Reinforcing steel.

B. Masonry accessories.

1.3 RELATED SECTIONS

A. Section 032000 - Concrete Reinforcement

B. Section 033000 – Cast-In-Place Concrete

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. 530, Building Code Requirements for Masonry Structures.
2. 530.1, Specifications for Masonry Structures.

B. American Society for Testing and Materials (ASTM):

1. C33, Concrete Aggregates.
2. C90, Load-Bearing Concrete Masonry Units.
3. C140, Methods of Testing Concrete Masonry Units.
4. C150, Portland Cement.
5. C331, Lightweight Aggregates for Concrete Masonry Units.
6. C618, Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

C. Portland Cement Association (PCA): Recommended Practices For Laying Concrete Block.

1.5 DEFINITIONS

A. Concealed: For Work required under this Section, the term "concealed" will mean "not exposed to view in finished construction."

B. Exposed: For Work required under this Section, the term "exposed" will mean "exposed to view in finished construction."

1.6 SUBMITTALS

A. Submit: Provide electronic (PDF) copies of all required submittal information.

1. Provide independent test reports following ASTM C140 for sampling and testing of CMU. Test reports shall be dated within six months of start of project. Test reports shall include net area compressive strength, absorption and density results, average width, height and length of each unit, minimum face shell thickness, average face shell thickness, minimum web thickness, average web thickness, and all other test reporting requirements as noted in ASTM C140.
2. Color samples for precolored units.
3. Masonry unit assembly components such as horizontal wire reinforcement, control joint material and masonry veneer ties.

1.7 QUALITY ASSURANCE

A. Follow ACI 530 and 530.1.

B. Maintain 1 copy of each referenced document at Site.

C. Manufacturer: Current NCMA member.

D. Provide units from single manufacturing source to ensure uniform texture for continuous and visually related areas.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver to Site only units properly cured and following these specifications.

B. Protect masonry units from damage and against moisture and weather, particularly against freezing and thawing. Maintain hollow concrete masonry units in their initial dry state until after they are laid up in wall.

C. Stack masonry units in dry place, off ground on prepared plank platform and in manner to promote circulation of air through and around block. Protect stacked block by shed roof or tarpaulin arranged to allow for circulation of air around and above stacked block.

D. Carefully handle masonry units. Do not build units into Work with chipped edges, spalls or other damage to their appearance which would show in finished wall.

E. Do not store adjacent to materials which can cause staining or discoloration.

1.9 PROJECT CONDITIONS

A. Do not erect masonry when, in Owner's Engineer's opinion, atmospheric conditions or limited facilities prevent proper setting, bonding and curing.

B. Protect tops of masonry walls against weather. Use strong, non-staining waterproof membrane secured with metal masonry wall clamps or properly weighted down. Maintain this protection during construction of walls and after their completion, properly anchored, repaired and replaced until tops of walls are covered by Work of others.

C. Leave necessary openings for passage of pipes, drains, ducts, wires and utility lines. Form chases shown, required or directed. Return and solidly close all openings at completion of Work of other trades. Remove rubbish and sweep out area before closing up any pipe chase, duct space or similar limited access or inaccessible area.

D. Coordinate with other trades and make provisions that will permit installation of their Work in manner to avoid cutting and patching. Build in items furnished by other trades as Work progresses.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150 Type 1.

B. Lime: ASTM C207 Type S.

C. Pozzolans: ASTM C618.

D. Aggregates: ASTM D33 normal weight or ASTM C331 lightweight. Provide either normal, medium or light weight units unless shown otherwise.

E. Mortar: Type S, following ASTM C270 Unit Proportion Requirements using preblended masonry cement.

F. Integral Water Repellent: ASTM E514 Class E.

1. Approved Product: Grace Construction Products' "Dry-Block" admixture.

G. Integral Color: Integral color pigment mixed with cement and aggregates during fabrication to match local licensee's color selection(s).

2.2 CONCRETE BLOCK

A. Hollow Units: ASTM C90 Type I; 1900 psi minimum compressive strength (net).

2.3 FABRICATION:

A. Follow ACI and NCMA.

B. Provide the following finishes and colors:

1. Exterior Concrete Block: Manufacturer's regular (smooth) molded finish and precolored during fabrication.

C. Provide integral water repellent in all exterior concrete block and exterior split face block units.

D. Provide concrete masonry units with modular dimension; standard units 7-5/8" high, 1'-3-5/8" long and 3/8" less nominal widths or thicknesses shown or required, with permissible variation of 1/16".

E. Provide special units for 90° corners, bond beams, bullnosed corners, control joint fillers, etc. shown or required.

F. Cure units minimum 14 days in presence of moist air following ASTM C426.

1. Provide block properly cured to 30% of maximum absorption. Questionable block will be tested and shipment rejected if average moisture content is found to exceed specification limits.
2. Do not build in block with moisture content exceeding specification requirements into Work. Dry block containing excess moisture to acceptable maximum either by further air drying or use of heat before being used.
3. No extension of time for completion will be allowed due to delay cause by failure of Contractor to maintain stored block at acceptable moisture content.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Inspect materials for defects before starting installation.

C. Reject any chipped or broken block. DO NOT BUILD DAMAGED UNITS INTO WORK.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Provide temporary bracing during installation of masonry Work. Maintain in place until building structure provides permanent bracing.

3.3 ERECTION / INSTALLATION / APPLICATION

A. Follow ACI and NCMA.

B. See Sections under which materials to be installed are furnished for additional installation requirements.

C. Use thoroughly dry concrete block with sharp, square, unbroken corners and edges and no cracks. DO NOT WET MASONRY UNITS.

D. Take special care in handling and storage of units for exposed block Work. Do not install chipped or marred block where exposed.

E. Lay block in running bond with each course lapping block below by 1/2 block unless shown otherwise.

F. Lay solid block units with full mortar coverage on head and bed joints and hollow block units with face shell bedding on head and bed joints. Mortar hollow block unit web joints in load bearing piers or pilasters, in starting course on footings or solid foundation walls and next to cores grouted solid.

1. Do not shift or tap masonry after mortar has achieved initial set. Remove mortar and replace where adjustments must be made.
2. Buttering corners of joints or excessive furring of mortar joints are not permitted.

G. Build walls and partitions true to dimension, plumb and square, laid to line in level courses, accurately spaced and coordinated with other Work. Keep individual face units "in plane" with walls rising together. Use double lines in multiple-tier walls with each tier plumb and all units "in plane."

H. Lay out Work to avoid fractional pieces. Interlock external corners. Set partitions on structural floor slabs before finish floor is laid unless shown otherwise.

I. Perform required cutting with power equipment which will produce true, straight, clean edges free of chipping and undamaged surfaces. CUTTING WITH HAMMER AND CHISEL WILL NOT BE PERMITTED. Use 100% solid block where webs would be exposed. Minimum length of cut units on exposed Work shall be 1/2 unit.

J. Cut units accurately to fit around pipes, ducts, openings, structural framing, etc. and slush voids full.

K. Take particular care to embed conduits and pipes within block without fracturing exposed shells and to fit units around switch, receptacle and other boxes set in walls. Grind and cut units before building in service where electric conduit, outlets, switch boxes and similar items occur.

L. Fill voids and joints between block and different types of materials with mortar.

M. Make joints approximately 3/8" wide. Line up joints vertically. Remove burrs with burlap or carpet after tooling.

N. Neatly tool interior and exterior joints below grade and in exposed masonry firm to slightly concave profile when mortar is thumbprint hard unless shown otherwise. Cut off flush and brush off surplus as Work progresses. Tool vertically then horizontally. Furnish all masons with joint tools of same diameter. Exception: Strike flush interior concealed joints (such as in chases and plenums) or those covered with directly applied finish materials.

O. Install vertical and horizontal masonry reinforcing where shown. Grout cores solid full length of reinforcing with masonry core grout specified in Section 033000. Maintain position of reinforcing within 1/2" of dimensioned position.

P. Fill voids receiving anchor bolts, wedge anchors, expansion bolts, etc. solid with masonry grout specified under Section 033000.

Q. Provide solid masonry bearing surface under lintels, beams, bearing plates, etc. as shown. Provide the following minimum solid bearing (as applicable) if not shown:

1. Lintels: Solid masonry bearing for full thickness of wall by length of bearing plus 8" by 8" high.
2. Beams: Solid masonry bearing for full thickness of wall by length of bearing plus 1'-4" by 2 feet high.

R. Provide solid masonry for course directly below corbelled masonry walls. Maximum corbel for each course is 1".

S. Provide closure, lintels, bond beams, jamb units, sash, corners headers and other special shapes shown or required. Provide standard manufactured sizes or cut full size block for fractional course heights and lengths. Provide sash blocks or other shapes designed to receive specified control joint filler strips.

T. Provide bullnosed units at exterior corners unless shown otherwise. Field grind to Owner's Engineer's satisfaction all external corners not installed bullnosed.

1. Exception: Provide square cornered blocks at window jambs.

U. Step back unfinished Work for joining with new Work. Toothing will not be permitted unless specifically approved by Owner's Engineer. Remove loose masonry and mortar and clean thoroughly before new Work is started.

V. Build in chases, openings, reinforcement, anchors, access doors, lintels, flashings and other items required. Provide centering required to properly support masonry until mortar attains design strength. Build in sleeves except where shown to be installed in other Sections.

W. Build hollow metal door frames into wall. Plumb and brace. Thoroughly embed frame anchors. Slush frame jambs full with mortar. Allow 1/4" for caulking around frame in exterior walls and 1/8" on interior unless shown otherwise. Rake out joints for caulking.

X. Fill masonry units solid with mortar 2 cores wide at each door jamb and 1 core wide at each window jamb for full height of opening.

Y. Hold block down approximately 2" below roof structural members such as beams, joists and roof deck subject to deflection at non-bearing walls.

Z. Provide control and expansion joints in all block Work. Reference Architectural Contract Drawings for masonry joint locations. Joints spacing shall not exceed 22 ft. on center nor shall a joint be located within two feet of an opening.

AA. Build in control joint filler strips in control joints as masonry is laid up allowing for caulking on each side of wall. Reference architectural for caulking material. Exception: Do not carry horizontal joint reinforcement through control or expansion joints.

BB. Maintain lateral support of intersecting masonry non- load bearing walls with wire mesh ties placed across joint between walls and spaced 1'-4" on center vertically.

CC. Install concealed masonry flashing where shown. Provide clean smooth surfaces set in full mortar bed and cover with full mortar bed. Seal penetrations and joints with mastic.

DD. Build in exposed sheet metal flashing, expansion joints and reglets occurring in masonry. Cut out mortar joint and set flashing or reglet in new mortar bed in existing construction.

EE. Build in bond beams grouting full and carefully position reinforcing where shown. Lap rebars a minimum length of 48 bar diameters. Field modify standard units required to receive required reinforcing where bond beam units are not available in specified finish.

FF. Any masonry Work found deficient in respect to these specifications will require entire wall to be removed and relayed at Contractor's expense.

3.4 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/32".

B. Maximum Variation From Plane of Wall: 1/4" in 10 feet and 1/2" in 20 feet or more.

C. Maximum Variation From Plumb: 1/4" per story non-cumulative; 1/2" in 2 stories or more.

D. Maximum Variation From Level Coursing: 1/8" in 3 feet, 1/4" in 10 feet and 1/2" in 30 feet.

E. Maximum Variation From Joint Thickness: 1/8" in 3 feet.

F. Maximum Variation From Cross Sectional Thickness of Walls: 1/4".

3.5 ADJUSTING AND CLEANING

A. Replace any masonry units which are loose or damaged and repair defective mortar joints. Make these repairs such that evidence of repair is not apparent.

B. Remove surplus mortar, drippings, splatter, etc. from exterior and interior masonry as Work progresses.

C. Clean, point and dry brush all exposed Work at end of each working day. Fill holes from line pins and nails.

D. Point joints to provide a neat uniform appearance. Cut out unrepairable defective joints. Fill solidly with mortar and tool to match adjacent Work. DO NOT CORRECT IMPERFECTIONS WITH SPACKLE.

E. Thoroughly rub out exposed Work to remove any projections. Fill indentations flush with surface.

F. Clean masonry surfaces upon completion from top down with water and fiber brushes to remove stains. ACID CLEANING OF MASONRY IS NOT PERMITTED.

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural steel and grout. All structural steel, hardware and connections shall be hot dip galvanized.

1.2 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

A. 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.

C. 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:

1. 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. All fabricated structural steel and hardware shall be hot dip galvanized in conformance with the requirements of ASTM A123 and A153.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. 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

A. 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.

1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Finish: Hot dip galvanized per ASTM A123 and A153.

C. Threaded Rods: ASTM A 36/A 36M.

1. Finish: Hot dip galvanized per ASTM A153.

2.3 HOT DIP GALVANIZING

A. All fabricated steel shall be hot dip galvanized per ASTM A123 and A153.

2.4 GROUT

A. 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.

2.6 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.

1. 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 SOURCE QUALITY CONTROL

A. 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.

C. 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:

1. 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 embedment's 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.

1. 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.

1. Joint Type: Snug tightened.

2. Joint Type (Pre-Engineered Frame): Bolted moment connection (turn-of-nut method)

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.

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.

B. 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.

1. 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:

a. 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 062000 - FINISH CARPENTRY

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Definition: Finish carpentry includes carpentry work which is exposed to view, is non - structural, and which is not specified as part of other sections.

Types of finish carpentry work in this section include:

- Fascias
- Trim
- Plastic Laminate

Rough carpentry is specified in another Division 6 section.

Builders Hardware and wood doors are specified in Division 8 sections.

Architectural woodwork is specified in another Division 6 section.

QUALITY ASSURANCE:
Factory mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

SUBMITTALS:
Product Data: Submit manufacturer's specifications and installation instructions for each item of factory fabricated siding and paneling.

PRODUCT DELIVERY, STORAGE AND HANDLING:
Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

JOB CONDITIONS:
Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

PART 2 - PRODUCTS

WOOD PRODUCT QUALITY STANDARDS:
Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

Plywood Standard: Comply with PS 1/ANSI A199.1.

Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

Hardwood Plywood Standard: Comply with PS 51.

Woodworking Standard: Where indicated for specific products comply with specified provision of the following:

Architectural Woodwork Institute (AWI) "Quality Standards."

Glued -up Lumber Standard: Comply with PS 56.

MATERIALS:
General:
Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.

Moisture Content of Softwood Lumber: Provide kiln -dried (KD) lumber having moisture content from time of manufacture until time of installation not greater than 6% to 11%.

Moisture Content of Hardwood Lumber: Provide kiln -dried (KD) lumber having moisture content from time of manufacture until time of installation from 6% to 11%.

Lumber for Transparent Finish (Stained or Clear): Use good grade pieces made of Cedar.
Lumber for Painted Finish: Any closed grain hardwood, AWI Section 300, custom grade.

INTERIOR FINISH CARPENTRY:
Shelving: 1" shelves 36" wide or over #1 SYP and ¾” for shelves under 36".

Cleats: #1 SYP.

Plastic Laminate: Countertops and backsplashes as per drawings.

Standards: Meet requirements and recommendations of applicable portions of standards listed.

Federal Specifications: FS equal to Wilson Art

Examining:

Examine surfaces that are to receive Laminated Plastic. Report unsatisfactory laminate condition.

Do not star installation of Laminated Plastic until satisfactory conditions have been corrected.

Proceeding with installation of Laminated Plastic will be constructed as evidence of acceptance of conditions under which work will be done.

Protecting:
Handle Laminated Plastic and items to avoid injury to person and to avoid damage to materials or to work in place. Satisfactorily repair or remove and replace work that has been damaged.

Protect adjacent surfaces from damage, soiling and adhering of adhesives and extra materials.

Protect Laminated Plastic from damage by weather and construction. Install necessary protective covering for surfaces that may have traffic during construction period.

Remove protective covering upon completion of project. Remove and replace work that has been damaged.

Delivering and Storing:

Deliver materials to site in manufacturer's original, unopened, labeled containers or packages.

Submit samples for approval of the Architect.

APPLICATION:
Trim shall be plumb and/or level with miter joints and finished as earlier specified. Pre-finished trim shall be required.

Application shall not take place sooner than 24 hours of temperatures less than 42 deg F.

Miscellaneous Materials:

Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, materials and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

All interior and exterior nails shall be galvanized.

Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

PART 3 - EXECUTION

PREPARATION:
Condition wood materials to the average humidity condition in installation areas prior to installing.

Back prime lumber for painted finish exposed on the exterior or, where indicated, to

moisture and high relative humidity on the interior. Comply with requirements of section on painting within Division 9 for primers and their application.

INSTALLATION:
Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8' -0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

Anchor finish carpentry work to anchorage devices or blocking built -in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where pre-finished matching fasteners heads are required, use fine finishing nail for exposed nailing, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

MILLWORK AND TRIM:
Exterior and interior millwork and trim shall conform to design and details shown. Where practical, work shall be finished and assembled at the mill. All mill work and trim shall be furnished smooth and free from machine and tool marks that will show through the finish. All nail heads shall be set to receive putty.

Doors and other movable parts shall be accurately fitted with proper clearances and left in perfect working order. Passage doors shall have a minimum clearance of 1/8" at sides and top, and doors and hardware shall be fitted to template so that they may be interchanged from opening to opening. All refitting necessary due to swelling shrinking, assembly or installation shall be done by this Contractor, for a period of one year after completion and acceptance of the building.

When dressing or cutting has been done, these surfaces shall be refinished. The work shall be left clean and free from warp, twist, open joints or other defects.

Metal thresholds: Fit and set metal thresholds in mastic.

LOCATION OF FINISH HARDWARE:
Locate hardware for door and door frames as follows unless shown otherwise on the drawings:

Center door knobs 38" above floor. Offset screen door latches to clear door locksets.

Center door pulls 42" above floor and push plates 48" above floors.

INSTALLATION OF WINDOWS:
Install windows and operating sash closed and locked, and set plumb, true, and centered in openings; securely anchored in place, using approved manufacturers

anchors specifically designed for use in the openings detailed.

Check all windows for smooth operation and proper function and adjust as required, prior to acceptance by the Architect.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:
Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

Refer to Division 9 sections for final finishing of installed finish carpentry work.

Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 062000

SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Extent of each type of architectural woodwork is indicated on drawings and in schedules.

Types of architectural woodwork include the following:
- Shelving
- Millwork
- Countertops
- Toilet Partitions

Finish carpentry is specified in another section of Division 6.

QUALITY ASSURANCE:
AWI Quality Marking: Mark each assembled unit of architectural woodwork with manufacturer's identification and grade mark evidencing compliance with indicated AWI quality grade. Locate grade mark on surfaces which will not be exposed after installation. For other items requiring field assembly, a certification of compliance may be substituted for marking of individual pieces.

Arrange for architectural woodwork with sequence matched wood veneers to be produced by a single firm.

REFERENCES:
AWI Quality Standard: Comply with applicable requirements of “Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI), excets otherwise indicated.

SUBMITTALS:
Product Data: Submit manufacturer's specifications and installation instructions for each item of factory fabricated woodwork.

Certification: Include certification that fire -retardant treated materials comply with governing regulations.

Quality Certification: Submit Manufacturer's (Fabricator's) certification, stating that fabricated work complies with quality grades and other requirements indicated.

Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Submit shop drawings for the following:

- Framed openings and lights, including trim.
- Shelving

PRODUCT DELIVERY, STORAGE AND HANDLING:
Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

JOB CONDITIONS:
Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period.

The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity condition.

PART 2 PRODUCTS
General: Except as otherwise indicated, comply with following requirements for architectural woodwork not specifically indicated as prefabricated or pre-finished standard products.

Wood Moisture Content: Provide kiln dried (KD) lumber with an average content range of 6% to 11% for interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed the following:

Interior Wood Finish: 5% - 10% for mild regions (as defined by AWI).

Plywood: Closed grain hardwood plywood with exterior glue complying with requirements for specified woodwork grade.

Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern and finish as indicated for each application, or if not indicated, as selected by Architect from manufacturer's standard products as well as the following;

Wilsonart -	All Available Colors, including Premium Colors
Formica -	All Available Colors, including Premium Colors
Nevamar-	All Available Colors, including Premium Colors

Quality Standards: For following types of architectural woodwork; comply with indicated standards as applicable:

Standing and Running Trim: AWI Section 300.
Casework and Countertops: AWI Section 400.
Shelving: AWI Section 600.
Miscellaneous Work: AWI Section 700.
Exterior Frames: AWI Section 900.

Design and Construction Features: Comply with details shown for profile and construction of architectural woodwork, and, where not otherwise shown, comply with applicable Quality Standards, with alternate details as Fabricator's option.

Pre -Cut Openings: Fabricate architectural woodwork with pre -cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing -in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water -resistant coating.

Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.

Where sequence of measuring substrates before fabrication would delay the project, proceed with fabrication (without field measurements) and provide ample borders and edges to allow for subsequent scribing and trimming of woodwork for accurate fit.

INTERIOR ARCHITECTURAL WOODWORK:
Core: Plywood. Particle core panels will not be accepted.

Construction: Reveal overlay.

Exposed Surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:

Horizontal Surfaces: GP -50 (0.050" nominal thickness).
Post Formed Surfaces: PF -42 (0.042" nominal thickness).
Vertical Surfaces: GP -28 (0.028" nominal thickness).

Except as otherwise indicated, provide separate plastic laminate countertops (installed over closed grain plywood substrate) to comply with requirements for casework for plastic laminate finish. Provide with coved backsplash. Note at science lab countertops, provide epoxy resin tops, black in color.

Fabricate exposed edges of casework, including edges of doors and drawers when open, with matching plastic laminate, except as otherwise indicated.

Shelves: 1" thick, reversible, plastic laminate finish all sides and all edges.

General: These requirements do not apply to shelving which is either integral with or indicated as "casework"; comply with casework requirements for those units of shelving.

Grade: Custom.

FINISH FOR ARCHITECTURAL WOODWORK:
General: The priming and pre-finishing (if any) of architectural woodwork required to be performed at the shop or factory is specified as work of this section. Refer to Division 9 sections for final finishing of installed architectural woodwork.

At the Contractor's option, he may use plastic laminate interior finish in lieu of painted surfaces.

Preparations for Finish: Comply with AWI Quality Standards, Section 1500, for sanding, filling countersunk fasteners, back priming and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

CABINET HARDWARE AND ACCESSORY MATERIALS:

General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of these specifications.

Hardware Standards: Except as otherwise indicated, comply with ANSI A156.9 " American National Standard for Cabinet Hardware".

Quality Level: Type 2 (institutional), unless otherwise indicated.

Quality Certification: Where available, provide cabinet hardware bearing the BHMA certification label, affixed either to hardware or its packaging, showing compliance with BHMA.

Cabinet Hardware Standard 201.

Cabinet Hardware: Provide all cabinet hardware required for proper installation and operation, whether listed below or not.

Metal Shelf Standards and Brackets: Provide one of the following:

No. 87 Standards and No. 187 Brackets; Knape & Vogt Mfg. Co.
Finish: Nickel-plated.

Pivoted Hinges: model no. Snap on 300 Series Hinge by Grass America

Finish for Butts and Hinges: Stain nickel-plated.

Cabinet Door Pulls: Steel Wire Pulls 4” C/C, Satin Chrome Finish

Door Pull Finish: Satin Chrome

Magnetic Cabinet Catches: Provide one of the following:

Aluminum, satin finish, No.916, Knape & Vogt.
Aluminum, satin finish, No.46 ALD, Standley Hardware Div.

Drawer Slides: KV 4100 Low Profile - Knape & Vogt Mfg. Co.

Locks: Master Lock Five (5) pin tumbler at all drawers and doors. Typical

Cabinet Door Hardware: Provide hinges, catches and pulls of types indicated, to accommodate each door size and style.

Drawer Hardware: Provide slides and pulls of types indicated, to accommodate each drawer size and style.

Equip each drawer with side-mounted, full-extension, ball-bearing, nylon roller drawer slides with load capacity of 75 lbs. per pair.

Locks: provide standard pin-type or disc-type (5 pins or discs) tumbler locks, keyed alike in each room, at all base and wall cabinets unless noted otherwise.

Shelf Supports: Where shelving is indicated as "adjustable:, provide slotted-type standards and brackets of type needed to properly support shelves with uniform 40-lb per sq. ft. loading.

Closet Bars: Telescoping steel or brass tubing, with forged end brackets; size and wall thickness as required to support full continuous hanging of clothing.

Exposed Hardware Finish: Provide exposed hardware with BHMA Code 626 satin chromium plate finish (US26D). Where not available, provide either satin aluminum or satin stainless steel finish.

PART 3 - EXECUTION

PREPARATION:
Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

INSTALLATION:
Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8' -0" for plumb and level (including countertops); and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

Standing and Running Trim: Install with minimum number of joints possible, using full length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.

Anchor woodwork to anchors or blocking built -in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where pre-finished matching fasteners heads are required, use fine finishing nails for exposing nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:
Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.

Clean woodwork on exposed and semi -exposed surfaces. Touch up shop applied finishes restoring damaged or soiled areas.

Protection: Installer of architectural woodwork shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 064000

SECTION 072000 - INSULATION

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of insulation work is shown on drawings and indicated by provisions of this section.

Applications of insulation specified in this section include the following:

Blanket type building insulation

Board Type Building Insulation, concealed

Metal Building Roof and Wall Insulation

QUALITY ASSURANCE:
Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.

Fire and Insurance Ratings: Comply with fire resistance, flammability and insurance ratings indicated, and comply with regulations as interpreted by governing authorities.

Federal Specifications: Where compliance with FS standard is indicated, specified requirements for marking individual boards/batts/blankets are waived, provided packages of units are labeled to show compliance.

SUBMITTALS:
Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

PRODUCT HANDLING:
General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

Protection for plastic insulation:

Do not expose to sunlight, except to extent necessary for period of installation and concealment.

Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 - PRODUCTS

MATERIALS:
Metal Building Roof And Wall Insulation:
Laminated Fiberglass: Owens-Corning Fiberglas, NAIMA 202, “Certified R” metal building insulation. TIMA Insignia and Insulation Thickness: Ink-jet printed on fiberglass.

Roof Insulation:
1. Nominal Thickness: ___10___ inches.
2. Certified R-Value: __34__.

Wall Insulation:
1. Nominal Thickness: ___8____ inches.
2. Certified R-Value: ___25___.

Roof and Wall Insulation Facing: PSK Light Duty (WMP-VR).
0.0015-inch-thick, UV-stabilized, white polypropylene laminated to 11-pound Kraft paper, reinforced with glass-fiber scrim, in white.

1. Adhere facing to Owens-Corning Fiberglas “Certified R”, NAIMA 202, fiberglass blanket.
2. Assembly of Insulation Blanket and Facing:
3. Flame Spread Rating: Less than 25.
4. UL Label: Submit as specified in Submittals article of this section.
5. Perm Rating: 0.09.

Insulation Support System
Insulation Support Strapping: Equal to RPR Products.

1. .020”.(5mm) hot dipped zinc coated steel.
2. Width: 1.25”
3. Install with self-drilling fasteners through strapping and into building structure at 5'-0” o.c.

Foam-in-place CMU wall insulation, with R-value including 8" cmu, 14.29 at 60lb. Density. The foamed -in-place is to be placed in the walls per manufacturer’s specifications. The material shall be applied in such a manner as to assure complete cavity fill. The product shall be applied with a liquid ratios at the mixing gun being within the manufacturer’s specified range. A cubic foot of the fresh foam shall weigh between 2lb. 80z. And 3lb. 6oz. After the installation of the material, allow two weeks for curing before painting the walls.
The installation of Thermco foam insulation shall be contracted only by a firm which is certified and/ or approved by the manufacturer of the insulation.

After the foam is installed and cured, walls shall be protected from excessive moisture (rain) for 24 hours.

AVAILABLE MANUFACTURER’S
PolyMaster - 1-800-580-3626
Core-Fill 500 - 828-322-6512

Cavity Wall Insulation: Extruded Polystyrene Board Insulation (EPsBd Ins): Rigid, Closed cell, extruded polystyrene thermal board insulation with integral high density skin; complying with ASTM C 578-95, Type IV, min 25 psi compressive strength, k vale of

0.20; maximum water absorption 0.1% by volume; 1.1 perm inch max. water vapor transmission. Thickness: As Noted. Provide manufacturer's standard lengths and widths.

Available Manufacturers:
Dow Chemical Co.; Midland, MI
UC Industries/U.S. Gypsum; Chicago, IL

Mastic: 1. For Styrofoam SM: Styrofoam Brand No. 11.

Mineral/Glass Fiber Blanket/Batt Insulation (M/GFB Ins): Inorganic (non-asbestos) fibers formed with hinders into resilient flexible blankets or semi rigid batts; FS HH I 521, Type as indicate, densities of not less than 0.5 lb. per cu. ft. for glass fiber units and not less than 2.5 lb. per cu. ft. for mineral wool units, k value of 0.27; manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated; types as follows:

Provide Type I - to be used in metal stud exterior partitions, "Thermal FSK-25 Faced Batts" by Certainteed or equal with the following characteristics:
Mildew and Fungi resistance, Maximum Flame Spread Index 25 or less, Smoke Developed index of 50.
Provide an R-value of 19, when 6" studs are used and an R-value of 13 when 3-5/8" studs are used.

Available Manufacturer's:
Certain Teed Products Corp.; Valley Forge, PA.
Clecon Inc.; Cleveland, OH.
Manville Bldg. Materials Corp.; Denver, Co.
Mizell Bros. Co.; Atlanta, GA.
Owens Corning Fiberglass Corp.; Toledo, OH.

Provide sound attenuation blankets at interior metal stud partitions. Refer to Section 07201 for more information.

PART 3 EXECUTION

INSPECTION AND PREPARATION:

Installer must examine substrates and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor retarders.

INSTALLATION

GENERAL:
Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions,

consult manufacturer's technical representative for specific recommendations before proceeding with work.

Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

CAVITY - WALL AND MASONRY-CELL INSULATION:
On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside width of masonry or other construction as shown.
Wedge insulation from outside wythe of construction with small fragments of masonry materials spaced 2' -0" o.c. both ways.

GENERAL BUILDING INSULATION:

Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for fire stopping.

Set reflective foil faced units accurately with air space in front of foil as shown. Provide not less than 0.75" air space where possible.

Lap edges of sheets of vapor barrier not less than 4" so as to provide complete coverage of protected areas.

PROTECTION:

General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

CLEAN-UP:

Remove and dispose of excess insulation, wrappings and other waste materials.

END OF SECTION 072000

SECTION 072010 - SOUND ATTENUATION BLANKETS

PART 1 - GENERAL

SCOPE

A. Perform all work required completing the Sound Attenuation Blanket Installation as indicated by the Contract Documents and furnish all supplementary items necessary for their proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all work required for this Section.

SUBMITTALS

A. Shop Drawings: Submit manufacturer's literature and mark sufficiently to indicate compliance with these specifications.

PART 2 - PRODUCTS

ACCEPTABLE PRODUCT/MATERIAL MANUFACTURERS

A. A specific product or material manufactured by any of the following listed manufacturers is "acceptable" (not "approved") only if the specific product or material can evidence exact compliance with the Contract Documents.

    1. Owens/Corning Fiberglass Corp.;
    2. Forty-eight Insulations, Inc.
    3. Manville
    4. Certain Teed Corporation
    5. United States Gypsum

B. Refer to Section 01630 - Substitutions and Product Options for manufacturers not listed above.

MATERIALS

A. INSULATION: Sound Attenuation Blanket, 3 5/8” thickness for 4” partition and 5 1/2” thick for 6" partition, unless otherwise indicated. Rated noncombustible when tested per ASTM E136.

PART 3 - EXECUTION:

INSTALLATION

A. Install at metal stud wall locations indicated.
B. Install in exact accordance with manufacturer's latest published requirements, specifications and details, and as indicated.

PROTECTION AND CLEANING

A. Protect all finished surfaces from damage or staining. Remove and replace all damaged or stained products.

B. Remove excess materials and debris from site.

END OF SECTION 07201

SECTION 074100 - PREFORMED ROOFING AND SIDING

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Extent of each type of preformed roofing and siding is indicated on the drawings and by provisions of this section. Provide exposed flashing gutters and trim to match. Preformed roofing/siding is hereby defined to include panels which are structurally capable of spanning between supports spaced as indicated.

The types of panels required include the following:
Formed sheet panels, intended for lapped seam installation.

QUALITY ASSURANCE:
Field Measurements: Where possible, prior to fabrication of prefabricated panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

SUBMITTALS:
Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

Metal roof system must be tested in accordance with ASTM E 1592-95 for negative loading. Determine panel bending and clips-to-panel strength by testing in accordance with ASTM E 1592-95 procedures.

Samples: Submit 2 samples 12" square, of each exposed finish material.

Shop Drawings: Submit small scale layouts of panels on walls and roofs, and large scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

WARRANTY:
Owner shall receive one (1) warranty from manufacturer of roof panels covering all of the following criteria. Multiple warranties are not acceptable.

1. Manufacturer’s 20 year watertight warranty, including coverage for all trim, flashings, and penetrations associated with the roof area.
2. 20 year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.
3. 20 year material coverage.
4. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.
5. Installers 2-Year Workmanship Warranty to manufacturer required.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:
Available Manufacturers: Subject to compliance with requirements, manufacturers offering preformed roofing and siding products which may be incorporated in the work include, but are not limited to the following:

METAL ROOFING AND SIDING:

Standing Seam Roof Systems: Roof Panels (Smooth) to be equal to Berridge Double-Loc Z-Lock, 16" Wide, 24 gauge. Color: Full Range of Standard Colors. (Color to Match Existing)

Metal gutter and Downspouts: to be pre-finished metal. Match finish at all trims, accessories exposed to view.

SHEET MATERIALS:
Steel for Painting/Coating: Hot dip coated steel sheet, ASTM A446, Grade A except where higher strength required for performance, G90 zinc coating, surface treated for maximum coating performance.

METAL FINISHES:
General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover, and retain until installation has been completed. Provide colors or color matches as indicated.

Flouropolymer Coating: Full strength 70% "Kynar 500" coating baked on for 15 minutes at 450 degrees F. (232 degree C), in a dry film thickness of 1.0 mil, 30% reflective gloss (ASTM D523), over min. 0.2 mil baked on modified epoxy primer.

Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.

UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. Grace Ultra
        b. Mid-States Asphalt Quick Stick HT Pro
        c. Polyglass Polystick MTS

d. Soprema Lastobond Shield HT
e. Tamko TW Underlayment or TW Metal & Tile Underlayment

2. Thermal Stability: Stable after testing at 240 deg F ASTM D 1970.
3. Low-Temperature Flexibility: Passes after testing at minus 20 deg F ASTM D 1970.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

MISCELLANEOUS MATERIALS:
Internal Panel Framing: Manufacturer's standard, as required for 120 MPH wind loading.

Fasteners: Manufacturer's standard non-corrosive types, with exterior heads gasketed.

Accessories: All exposed fascia, metal trim shall match metal roof color. Except as indicated as work of another specification section, provide components required for a complete roofing/siding system, including trim, copings, fascias, gravel stops, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, louvers, sealants, gaskets, fillers, closure strips and similar items. Match materials/finishes of preformed panels.

PANEL FABRICATION; PERFORMANCES:
General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill indicated performance requirements which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements, and with structural requirements. Provide only full length sheets.

Metal Gages: Thicknesses shall be 24 gage.

Required Performances: Fabricate panels and other components of roof/wall system for the following installed as indicated performances:

Water Penetration: No significant, uncontrolled leakage at 4 lbs. per sq. ft. pressure with spray test.

Air Infiltration: 0.02 cfm per sq. ft. for gross roof/wall areas, with 4 lbs. per sq. ft. differential pressure.

Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials which are non-compatible or could result in corrosion or deterioration of either material or finishes.

Condensation: Fabricate panels for control of condensation, including proper inclusion of seals and provisions for breathing, venting, weeping and draining.

Wind Loads: See Structural Plans and Design Wind Pressure Letter.

PART 3 - EXECUTION
INSTALLATION:

General: Comply with panel fabricator's and material manufacturers' instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement. Metal roof panels must be installed in accordance with UL 90 Construction method.

Install panels with concealed fasteners.

Installation tolerances: Shim and align panel units within installed tolerance of 1/4: in 20' 0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.

Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.

Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

Joint Sealers: Refer to other sections of these specifications for post installation requirements on joint sealers; not work of this section.

CLEANING AND PROTECTION:
Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch up or similar minor repair procedures.

Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.
END OF SECTION 074100

SECTION 076000 - SHEET METAL FLASHING AND TRIM

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

A. Provide all labor, equipment, and materials to fabricate and install the following.

1. Edge strip and flashing.
2. Fascia and trim.
3. Coping cap at parapets.
4. Fascia and edge metal.

B. Related Work Specified Elsewhere:

1. Division 06 Rough Carpentry
2. Division 07 Modified Bituminous Membrane Roofing
3. Division 07 Roof Accessories
4. Division 07 Roof & Deck Insulation
5. Division 07 Manufactured Metal Roof Panels

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.
2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

5. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

B. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI)

1. ANSI/SPRI ES-1 Testing and Certification Listing of Shop Fabricated Edge Metal

C. Warnock Hersey International, Inc., Middleton, WI (WH)

D. Factory Mutual Research Corporation (FMRC)

E. Underwriters Laboratories (UL)

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1. Latest Edition Architectural Sheet Metal Manual

2. Roofing and Waterproofing Manual

G. National Roofing Contractors Association (NRCA)

H. American Society of Civil Engineers (ASCE)

1. ASCE 7-05 Minimum Design Loads for Buildings and Other Structures.

1.4 SUBMITTALS FOR REVIEW

A. Product Data:

1. Provide manufacturer's specification data sheets for each product.

2. Metal material characteristics and installation recommendations.

3. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

B. Samples: Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.

C. Shop Drawings

1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.

2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.

3. Indicate type, gauge and finish of metal.

D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

1.5 SUBMITTALS FOR INFORMATION

A. Design Loads: Any material submitted must be accompanied by a report signed and sealed by a professional engineer licensed in the state of Texas. This report shall show that the submitted equal meets the wind uplift and perimeter attachment requirements according to ASCE 7-05 and ANSI/SPRI ES-1. Submitals without licensed engineer approval will be rejected for non-conformance.

B. A letter from an officer of the manufacturing company certifying that the materials furnished for this project are the same as represented in tests and supporting data.

C. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.

D. Certification of work progress inspection. Refer to Quality Assurance Article below.

E. Certifications:

1. Submit certification that the perimeter/edge metal products being used on this project have been tested according to ANSI/SPRI ES-1 criteria. Certification submitted must be provided by either NRCA, Independent Test Agency or the perimeter/edge metal manufacturer.

1.6 QUALITY ASSURANCE

A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years experience.

B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of five (5) years experience with the installation of similar system to that specified.

C. Upon request fabricator/installer shall submit work experience and evidence of financial responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.8 PROJECT CONDITIONS

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal edge system.

1.9 DESIGN AND PERFORMANCE CRITERIA

A. Wind Uplift Pressures: Metal edge system must meet minimum design load pressures as determined by ASCE 7. Provide completed calculations to show ANSI/SPRI ES-1 test results meet the minimum wind uplift pressures.

B. Thermal expansion and contraction:

1. Completed metal edge flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

1.10 WARRANTIES

A. Owner shall receive one (1) warranty from manufacturer covering all of the following criteria. Multiple warranties are not acceptable.

1. Pre-finished metal material shall require a written twenty (20)-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D2244 or chalking excess of 8 units per ASTM D659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for a warranty.

3. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.

4. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of (2) two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

PART 2 — PRODUCTS

2.1 PRODUCTS, GENERAL

A. Refer to Division 01 Section "Common Product Requirements."

B. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

2.3 ACCEPTABLE FABRICATORS

A. Any fabricator which has been certified by the NRCA (National Roofing Contractors Association) to fabricate their ANSI/SPRI ES-1 tested profiles on their Gravel-Stop, Metal Edge, Fascia and Coping Cap products**.**

B. Provide a product carrying a signed and sealed Performance Test Report from a testing company for ANSI/SPRI ES-1 on their Gravel-Stop, Metal Edge, Fascia and Coping Cap products.

C. Any fabricator with a Gravel-Stop, Metal Edge, Fascia and Coping Cap products that has been tested in accordance with ANSI/SPRI ES-1 standards. Proof of this testing must be provided via a report signed and sealed by a qualified third party testing agency. This report shall show that the submitted equal meets the wind uplift and perimeter attachment requirements according to ASCE 7-05 and ANSI/SPRI ES-1. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance

2.4 MATERIALS

A. Materials:

1. Exposed base metal material:

a. Aluminum, ASTM B209, alloy 3105-H14, in thickness of .032" nom. or .040" nom. or .050" nom. or .063" nom.

2. Unexposed base metal material:

a. Zinc-coated steel, ASTM A653, coating designation G-90, in thickness of 0.0299 nom./ 22 gauge, 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.

3. Minimum gauge of steel or thickness of Aluminum to be specified in accordance with Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractor's National Association, Inc. recommendations.

B. Finishes:

1. Exposed surfaces for coated panels:

a. Steel Finishes: fluorocarbon finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer.

Weathering finish as referred by National Coil Coaters Association (NCCA).

PROPERTY	TEST METHOD	FLUOROCARBON*
Pencil Hardness	ASTM D3363 NCCA II-2	HB-H
Bend	ASTM D-4145 NCCA II-19	O-T
Cross-Hatch Adhesion	ASTM D3359	no loss of adhesion
Gloss (60° angle)	ASTM D523	25+/-5%
Reverse Impact	ASTM D2794	no cracking or loss of adhesion
Nominal Thickness	ASTM D1005	
Primer		0.2 mils
Topcoat		0.8 mils
TOTAL		1.0 mils

* Subject to minimum quantity requirements

b. Color shall be from manufacturers full range. (Color to Match Existing)

2. Exposed and unexposed surfaces for mill finish flashing, fascia, and coping cap, shall be as shipped from the mill.

3. Exposed and unexposed surfaces for anodized aluminum flashing, fascia, and coping cap, shall be as shipped from mill.

2.4 RELATED MATERIALS AND ACCESSORIES

A. Metal Primer: Zinc chromate type.

B. Plastic Cement: ASTM D 4586

C. Sealant: Tuff-Stuff One part polyurethane sealant.

D. Underlayment: ASTM D2178, No15 asphalt saturated roofing felt.

E. Slip Sheet: Rosin sized building paper.

F. Fasteners:

1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.

2. Fastening shall conform to Factory Mutual requirements or as stated on section details, whichever is more stringent.

G. Gutter and Downspout Anchorage Devices: Material as specified for system.

PART 3 — EXECUTION

3.1 EXECUTION, GENERAL

A. Refer to Division 07 Section Common Work Results for Thermal and Moisture Protection.

3.2 PROTECTION

A. Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.

3.3 GENERAL

A. Secure fascia to wood nailers at the bottom edge with a continuous cleat.

B. Fastening of metal to walls and wood blocking shall comply with building code standards.

C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.

D. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. Exposed face fastening will be rejected.

3.4 INSPECTION

A. Verify that curbs are solidly set and nailing strips located.

B. Perform field measurements prior to fabrication.

C. Coordinate work with work of other trades.

D. Verify that substrate is dry, clean and free of foreign matter.

E. Commencement of installation shall be considered acceptance of existing conditions.

3.5 SHOP-FABRICATED SHEET METAL

A. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

B. Hem exposed edges.

C. Angle bottom edges of exposed vertical surfaces to form drip.

D. Lap corners with adjoining pieces fastened and set in sealant.

E. Form joints for gravel stop fascia system, coping cap with a 3/8" opening between sections. Back the opening with an internal drainage plate formed to the profile of fascia piece.

F. Install sheet metal to comply with referenced ANSI/SPRI, SMACNA and NRCA standards.

3.7 CLEANING

A. Clean installed work in accordance with the manufacturer's instructions.

B. Replace damaged work than cannot be restored by normal cleaning methods.

3.8 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated. Comply with requirements of authorities having jurisdiction

3.09 FINAL INSPECTION

A. At completion of installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Inspect work and flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Notify the Contractor upon completion of corrections.

E. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

F. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty-four (24) hours, the Owner will exercise rights to correct the Work under the terms of the Conditions of the Contract.

END OF SECTION 076000

SECTION 079000 - JOINT SEALERS

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.

Refer to Division 8 sections glazing requirements; not work of this section.

Refer to sections of Division 15 and 16 for joint sealers in mechanical and electrical work; not work of this section.

General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

SUBMITTALS:
Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product required.

JOB CONDITIONS:
Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

PART 2 - PRODUCTS

MATERIALS:
General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated select modules of elasticity and hardness or grade recommended by manufacturer for each application indicated. Where exposed to foot traffic, select non-tracking materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

Sealant: (with expansion and compression capability of plus or minus 50%).
Silpruf Silicone weatherproofing sealant: General Electric
790 Building Sealant: Down Corning

Caulking:
NP -2 Sonneborn. Polyurethane
Install at all locations where notes as "caulk" or required to provide a neat joint.

Expansion Joint Sealer:
ACMA Seal: ACME Highway Products Corp., Buffalo, N.Y. 14207

System: Series “J”, Style No. 2-602, 1-3/4" wide x 2" high.
Install with manufacturer’s ACMA Lubricant Adhesive.

Foam Joint Filters:
Expanded Polyethylene Joint Filler (ExPe -JF): Provide flexible, compressible, closed -cell, polyethylene of not less than 10 psi compression deflection (25%) except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants; surface water absorption of not more than 0.1 lbs. per sq. ft.

MISCELLANEOUS MATERIALS:
Sealant backer Rod (S -Br): Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for backup of an compatibility with sealant. Where used with hot -applied sealant, provide heat -resistant type which will not be deteriorated by sealant application temperature as indicated.

PART 3 - EXECUTION

INSPECTION:
Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

JOINT PREPARATION:
Clean joint surfaces immediately before installation of gaskets, sealant or caulking compounds. Remove dirt, insecure coatings, moisture and other substances which could interfere with seal of gasket or bond of sealant or caulking compound. Etch concrete and masonry join surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.
INSTALLATION:
Install at exterior doors, glass frames (both interior and exterior of frames), exterior louvers, windows, exterior joints in walls and other locations where indicated or required to provide weather tight joints. Indicated for floor or wall assembly in which penetration occurs.

Install in accordance with manufacturer's recommendations.
Produce beads of proper width and depth.
Tool as recommended by manufacturer.
Remove surplus materials.

Study drawings and furnish and install proper materials at each point where called for on the drawings plus all other points essential to continued integrity of the watertight barrier.

CURE AND PROTECTION
Cure sealants and caulking compounds in compliance with manufacturer's instructions

and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise the Contractor of procedures required for cure and protection of joint sealer during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner which will minimize increases in modules of elasticity and other accelerated aging effects. Replace or restore sealant which are damaged or deteriorated during construction period.

END OF SECTION 079000

SECTION 08220
FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FIBERGLASS RESIN TRANSFER MOLDED DOOR FRAMES

MODEL CP3 SINGLE DOOR
FIRE RATED SERIES MEETING UL 10(C)
POSITIVE PRESSURE AND UL 10(B) NEGATIVE PRESSURE
MANUFACTURED IN THE UNITED STATES OF AMERICA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes The Following:

1. Fire Rated Fiberglass reinforced Plastic (FRP) Doors certified by Intertek Testing Services for Warnock- Hersey in 20, 45, 60 and 90-minute ratings, meeting all specifications of UL 10(B) and (C) fire door test standards. Category A and B.
   a) Category A doors are labeled for compliance with UBC 7-2-1997 (Positive Pressure) and do not require the application of an additional edge sealing system.
   b) Category B doors are labeled to require the installation of a listed edge sealing system to meet the requirements of UBC 7-2-1997 (Positive Pressure). This seal must be installed per the manufacturers instructions and may be factory or field applied.
   c) Category B constructed doors, if requested and with certain restrictions, may be provided with an UL 10 (B) label (Negative Pressure) and at a later date can be upgraded to a UL 10 (C) category B label (Positive Pressure) with the application of a listed seal system. Changing labels on installed doors will only apply to UL 10 (B) doors with Chem-Pruf door register number 57677 and higher, and will require an on-site visit by either Chem-Pruf® or Warnock-Hersey to change out the labels.

2. Fire Rated Fiberglass Resin Transfer Molded Door Frames certified by Intertek Testing Services for Warnock- Hersey in 20, 45, 60 and 90-minute ratings, meeting all specifications of UL 10(C) fire door test standards, Category C.

3. Fire Rated Fiberglass reinforced Plastic (FRP) Doors and Fiberglass Resin Transfer Molded Door Frames certified by Intertek Testing Services for Warnock- Hersey in 20, 45, 60 and 90 minute ratings, meeting all specifications of UL 10(B) fire door test standards.

1.2 RELATED SECTIONS

A. Related Sections Include The Following:
   1. Division 0 - Bidding and Contract Requirements
   2. Division 1 - General Requirements
   3. Division 8 - Finish Hardware
   4. Division 8 - Glazing

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1.3 QUALITY ASSURANCE

Test certification by independent and accredited laboratories. Reports available upon request.

A. Referenced Standards

1 Door and Frame Assembly Properties

a) ASTM E 152 UL 10(b) NFPA 252 and UBC 43-2
b) SFBC PA 201. Impact procedures for large missile impact.
c) SFBC PA 202. Uniform static load on building components
d) SFBC PA 203 Products subjected to cyclic wind pressure.
e) SFBC 3603.2 Forced entry test
f) ASTM C 518 Standard test method for steady for state thermal transmission properties by means of the heat flow meter apparatus.
g) ASTM D 1761 Mechanical Fasteners

2. Laminate Properties

a) ASTM D 638 Tensile Strength
b) ASTM D 790 Flexural Strength
c) ASTM D 2583 Barcol Hardness
d) ASTM D 256 Impact Resistance
e) ASTM D 792 Density/Specific Gravity Of Laminate
f) ASTM D 1761 Mechanical Fasteners
g) ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
h) ASTM E 84 - Standard Test Method for a Surface Burning Characteristics of Building Materials.

3. Core Properties

a) ASTM C 177 Thermal Properties
b) ASTM D 1622 Density/Specific Gravity
c) ASTM E 84 Surface Burning Characteristics
d) WDMA TM-10 and TM-5 ASTM E 152 U.L. 10(b)
e) ASTM C-36 Type X ±
f) Federal Specification SS-6-30D Type III, Gladex
g) Firestop ASTM E 152 UL 10(b)
h) ASTM E90-04 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
i) ASTM E413-04 – Classification for Rating Sound Insulation
j) ASTM E1332-90 – Standard Classification for Determination of Outdoor-Indoor Transmission Class
k) ASTM E2235-04 – Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Methods

B. Qualifications

1. Manufacturer Qualifications: A company specialized in the manufacture of fiberglass reinforced plastic (FRP) doors and frames as specified herein with a minimum of **30 years documented experience** and with a record of successful in-service performance for the applications as required for this project.
2. Installer Qualifications: An experienced installer who has completed fire rated fiberglass door and frame installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.
3. Source Limitations**: Obtain fiberglass reinforced plastic doors and resin transfer molded**

fiberglass frames through one source fabricated from a single manufacturer. This ensures complete uniformity of physical properties and consistency in the resin chemistry tailored for this application.

4. Source Limitations: Hardware and accessories for all FRP doors as specified in Section 08710 shall be provided and installed by the fiberglass door and frame manufacturer. **Certified hardware installer must be qualified in accordance with UL10(b), UL10(c) and FBC.**
5. Source Limitations: Glass for windows in doors shall be furnished and installed by door and frame manufacturer in accordance with related section, Division 8, Glazing.

1.4 SUBMITTALS

A. Product Technical Data Including:
1. Acknowledgment that products submitted meets requirements of standards referenced
2. Manufacturer shall provide certificate of compliance with current local and federal regulations as it applies to the manufacturing process.
3. Manufacturer's installation instructions.
4. **Schedule of doors** and frames indicating the specific reference numbers as used on the **owner's project documents**, noting **door type, frame type**, **size**, **handing** and applicable **hardware.**
5. Details of core and edge construction. Include factory-construction specifications.
6. Certification of manufacturer's qualifications.

B. Submittal Drawings For Customer Approval Shall Be Submitted Prior To Manufacture And Will Include The Following Information And Formatting.

1. Summary door schedule indicating the specific reference numbers as used on owner's drawings, with columns noting door type, frame type, size, handing, accessories and hardware.
2. A drawing depicting front and rear door elevations showing hardware with bill of material for each door.
3. Drawing showing dimensional location of each hardware item and size of each door.
4. Individual part drawing and specifications for each hardware item and FRP part or product.
5. Construction and mounting detail for each frame type.
6. Provide color sample chip of selected color. (Forest Green OP17)

C. Samples:

1. **Provide one complete manufactured door sample which represents all aspects of the typical manufacturing process, including molded-in gelcoat color and plate construction. One edge should expose the interior of the door, depicting the stile and rail, hardware reinforcement and core material.**

D. Operation and Maintenance Manuals:

1. Include recommended methods and frequency for maintaining optimum condition of fiberglass doors and frames under anticipated traffic and use conditions.
2. Include one set of final as built drawings with the same requirements as mentioned in Section B above.
3. Include certificate of warranty for door and frame listing specific door registration numbers.
4. Include hardware data sheets and hardware manufacturer's warranties.

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1.5 DELIVERY, STORAGE AND HANDLING

A. Each door and frame shall be delivered **individually crated** for protection from damage in cardboard containers, **clearly marked** with project information, door location, specific reference number as shown on drawings, and shipping information. **Each crate shall contain all fasteners necessary for installation as well as complete installation instructions.**
B. Doors shall be stored in the original container on edge out of inclement weather for protection against the elements.
C. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

1.6 WARRANTY

A. All fiberglass doors and frames have a lifetime guarantee against failure due to corrosion. Additionally, fiberglass doors and fiberglass frames are guaranteed for ten years against failure due to materials and workmanship, including warp, separation or delamination, and expansion of the core.
B. On Site Assistance Available.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
A. **Chem-Pruf Door Co., Ltd., P.O. Box 4560, Brownsville, Texas 78523**
Phone: 1-800-444-6924, Fax: 956-544-7943, Website: www.chem-pruf.com
B. Substitutions may be considered, provided manufacturer can comply with the specifications as written herein. Requests for substitution must be submitted in writing no less than 10 days prior to bid date. **Substitution request to include a physical sample and written documentation that product will meet the specific manufacturing methods as highlighted below.**

2.2 FRP DOORS

A. Fire Rated Fiberglass reinforced Plastic (FRP) **Doors certified by Intertek Testing Services for Warnock-Hersey in 20, 45, 60 and 90 minute ratings** meeting all specifications of UL 10(c) and UL 10(b) fire door test standards.
B. Doors shall be made of **fiberglass reinforced plastic** (FRP) using chemically proven fire retardant resins resistant to contaminants typically found in the environment for which these specifications are written. Doors shall be 1 3/4 inch thick and of flush construction, **having no seams or cracks.** Doors shall have equal diagonal measurements.
C. Door Plates shall be molded in one continuous piece, starting with a **25-mil gelcoat of the color specified (Forest Green OP17), integrally molded** with at least two layers of 1.5 ounce per square foot fiberglass mat.
D. Stiles and Rails Core shall be banded by a matrix of fire resistant mineral and glass fiber material.
E. Core material shall be fire resistant **mineral core** placed within band structure allowing no voids within.
F. Finish of door and frame shall be identical in color and finish. At time of manufacture**, 25 mil of resin-rich gelcoat must be integrally molded into both the door and frame**. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120 F to 170F creating an **impermeable outer surface**, **uniform color throughout**, and a **permanent homogeneous bond** with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat result in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and frame **must be field repairable** without compromising the integrity of the original uniform composite structure, function or physical

strength.

G. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Window kits shall be fire rated per U.L. for rating of opening and function of same.

2.3 FRAMES

A. Frames shall be **fiberglass** manufactured using the **resin transfer method creating one solid piece** with complete uniformity in color and size. Frames shall have a minimum of two layers continuous strand fiberglass mat saturated with fire retardant resin. Frames will be of one-piece construction with molded stop. The mineral core and reinforcement material shall be completely encapsulated. Pultruded frames or frames of dissimilar materials, such as metal will not be accepted.

B. Finish **of frame shall be identical to the door with a minimum 25-mil resin rich gelcoat of the specified color integrally molded in** at time of manufacture. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120 F to 170F creating an **impermeable outer surface**, **uniform color throughout**, and a **permanent homogeneous bond** with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat result in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and frame **must be field repairable** without compromising the integrity of the original uniform composite structure, function or physical strength.

C. Jamb/Header connection shall be mitered for tight fit.

D. Internal Reinforcement shall be inorganic in nature and continuous within the structure to allow for mounting of specified hardware. This material shall have a minimum screw holding value of 1000 lbs per screw.

E. Mortises for hardware shall be accurately machined **by CNC to hold dimensions in all three axis**.

F. Hinge pockets shall be **accurately machined by CNC** to facilitate heavy-duty hinges at all hinge locations, using spacers when standard weight hinges are used.

2.4 HARDWARE

A. See Section 08710

B. Due to the special nature of the material in this section, all **related hardware as specified must be furnished and installed by the door and frame manufacturer to ensure sufficient reinforcement, proper sealing, precision tooling and that all hardware complies with the regulations of the manufacturer's testing agencies.**

PART 3 - EXECUTION

3.1 INSTALLATION CONDITIONS

A. Verification of Conditions
   1. Verify openings are correctly prepared to receive doors and frames.
   2. Verify openings are correct size and depth in accordance with shop drawings or submittals.

B. Installer's Examination
   1. Have the installer examine conditions under which construction activities of this section are to be performed and submit a written report if conditions are unacceptable.
   2. General Contractor shall submit two copies of the installer's report to the architect within 24 hours of receipt.
   3. Begin construction activities of this section only after unacceptable conditions have been corrected.

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3.2 INSTALLATION

A. Door shall be delivered to job site **individually crated**. Each crate to be clearly marked with the specific opening information for quick and easy identification.
B. All single doors to be shipped **completely assembled in the frame with hardware installed**. Double doors to **be prehung at the factory to ensure a proper fit** and that hardware functions properly, then disassembled for shipping purposes. **If unitization is not provided by manufacturer, installation of door and frame systems should be made by a professional hardware installer, certified by a nationally recognized door hardware entity.**
C. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
D. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.
E. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions.
F. Fire labeled doors and frames must be installed in strict accordance with manufacturer's instructions and the latest version of NFPA 80.

3.3 ADJUSTING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.
B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

3.4 CLEANING

A. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

3.5 PROTECTION OF INSTALLED PRODUCTS

A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

END OF SECTION

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SECTION 083323 OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated rolling service doors.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Support framing and framed opening.

B. Section 06200 - Finish Carpentry: Wood jamb and head trim.

C. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09900 - Painting: Field applied finish.

1.3 REFERENCES

A. ANSI/DASMA 108 - American National Standards Institute Standard Method For Testing Sectional Garage Doors And Rolling Doors: Determination Of Structural Performance Under Uniform Static Air Pressure Difference.

B. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

C. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.

D. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

E. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

G. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

H. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

J. NEMA MG 1 - Motors and Generators.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Details of construction and fabrication.
   4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer’s limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Warranty: Manufacturer’s limited door system warranty for 2 years for all parts and components.

C. PowderGuard Finish
1. PowderGuard Max: Applied to curtain, guides, bottom bar, headplates: Manufacturer’s limited Max Finish warranty for 5 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corporation, 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 INSULATED ROLLING SERVICE DOORS

A. Stormtite Insulated Rolling Service Doors: Overhead Door Corporation Model 625.
1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
a. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
b. Front slat fabricated of:
1) 24 gauge galvanized steel.
c. Back slat fabricated of:
1) 24 gauge galvanized steel.

d. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
    1) R-Value: 7.7, U-Value: 0.13.
    2) Sound Rating: STC-21.

2. Performance:
    a. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
    b. Installed System Sound Rating: STC-21 as per ASTM E 90.
    c. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
    d. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft2.
3. Slats and Hood Finish:
    a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
        1) Polyester Top Coat.
            (a) To be selected from full range of colors.
4. Weatherseals:
    a. Vinyl bottom seal, exterior guide and internal hood seals.
    b. Interior guide weatherseal.
    c. Lintel weatherseal.
    d. Air Infiltration Package, IECC 2012/2015 listed; product to meet C402.4.3 2012 Air leakage <1.00 cfm/ft2.
        1) Air infiltration perimeter seal package includes: guide cover, guide cap, dual brush exterior guide seal, 4 inch finned lintel brush seal and vinyl bottom seal.
5. Bottom Bar:
    a. Two prime painted steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
    b. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
    c. Two stainless steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
    d. Extruded aluminum angle minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
6. Guides: Three structural steel angles.
7. Brackets:
    a. Hot rolled prime painted steel to support counterbalance, curtain and hood.
8. Finish; Bottom Bar, Guides, Headplate and Brackets:
    a. PowderGuard Zinc base coat, gray.
9. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
10. Hood: Provide with internal hood baffle weatherseal.
    a. 24 gauge galvanized steel with intermediate supports as required.
11. Manual Operation:
    a. Crank operation.
12. Wind Load Design:
    a. Standard wind load shall be 20 PSF.
13. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
14. Locking:
    a. Chain keeper locks for chain hoist operation.

15. Wall Mounting Condition:
    a. Face-of-wall mounting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

G. Install perimeter trim and closures.

H. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

Chem-Pruf Pultrusion Fixed Sash (Fixed Windows)

Specification SECTION 08 50 00

Fiberglass Windows

PART 1 - GENERAL

1.01 SCOPE AND DEFINITIONS

A. Furnish and install fixed sashes of FRP composite construction in accordance with details and schedule shown on the project drawings and as specified herein. Fixed sash products of aluminum, steel or wood constructions are strictly excluded.

B. FRP is defined as “Fiberglass Reinforced Polyester”

1.2. RELATED SECTIONS

A. Section 04 00 00: Masonry mortar

B. Section 05 50 00: Steel lintels

C. Section 06 20 00: Finish Carpentry

D. Section 08 80 00: Glazing

1.03 QUALITY ASSURANCE

A. Referenced Standards
   1. American Society for Testing and Materials (ASTM)
   2. Society of Automotive Engineers (SAE)
   3. International Building Code, Plastics (Chapter 26)

B. Experience: Manufacturer shall be engaged in the manufacture of FRP door and frame systems for a minimum of twenty five (25) years documented experience prior to the start of this work, and who has a history of successful production acceptable to the Architect.

C. Referenced Standard: Where labeled fixed sashes or fixed windows are required, fiberglass fixed sashes shall be UL listed and shall be tested successfully to UL9 / UBC 7-4 (1997) standards.

D. Warranty: Provide written limited guarantee for FRP Fixed Sash as follows:
   1. Fiberglass fixed sash (fixed windows): Fiberglass fixed sashes and windows are guaranteed for the life of the product against failure due to corrosion from the specific chemical environment named at the time of purchase. Furthermore, all products are inspected prior to shipment and guaranteed against defective workmanship for a period of ten (10) calendar years after the date of purchase.

1.04 SUBMITTALS

A. Product Data: Provide catalog cut of FRP fixed sashes detailing internal construction, reinforcements and materials used.

B. Shop Drawings: To include the following specific information:

1. Specifications relating to method of construction, finish color, type of glass and glazing, anchor systems, joint construction and complete warranty information.
2. Complete schedules or drawings of FRP fixed sashes showing identifying mark numbers, door and frame types, typical elevations, nominal sizes, handing, actual dimensions and clearances, and required hardware preps and reinforcements.
3. Supporting reference drawings pertaining to fixed sash mounting details.

C. Color Samples: Provide a complete set of available finish colors from the manufacturer for color selection upon request.

D. Installation instructions: Include manufacturer's specific information describing procedures, sequence and required fasteners for frame and door installation.

E. Production of FRP fixed sashes shall not proceed until final approval of submittals and all necessary manufacturing information is received from customer.

1.05 DELIVERY, STORAGE AND HANDLING

A. FRP fixed sashes are delivered to your site in adequate crating with foam sheet separations.

B. Upon receipt of shipment, remove and inspect the fixed sashes for damage. Note any damage on the shipping papers prior to accepting. If there is any noted (visible or concealed) damage, notify Chem-Pruf at 1-800-444-6924, immediately.

C. Handling and storage of the fixed sashes after receipt is the responsibility/liability of the customer. It is recommended that the fixed sashes be stored indoors in a vertical position, clear of the floor, with blocking between the fixed sashes to permit air circulation between the fixed sashes and prevent damage. Rain/water or condensation must not be allowed to collect or lay between stored fixed sashes. Do not wrap in plastic sheeting as it will promote condensation formation within. Permanent discoloration can result. Failure to comply with the receiving and reporting instructions shall void the Chem-Pruf warranty.

D. Use care in handling FRP fixed sashes to prevent damage to factory finishes. Wear protective gloves and do not slide or drag fixed sashes against one another.

PART 2 - PRODUCTS

2.01 Manufacturer

A. FRP fixed sashes shall be as manufactured by Chem-Pruf, 5224 FM 802 Brownsville, TX 78521 ph 800.444.6924 website: www.chem-pruf.com.

2.02

A. Non-fire rated FRP Fixed Sashes and Window Walls:
1. Design: FRP Fixed Sashes and Window Walls furnished under this specification shall utilize a high-modulus pultruded structural FRP shape. The fixed sash and window frame section shall be standard double rabbeted 5-3/4" deep x 2" face, 3/16" thick, with integral 5/8" stops to match typical hollow metal configurations. Additional jamb profiles and widths are available.
2. Corner Joints: Frame jambs and header shall be joined at corners via miter connections with hidden FRP angle clips and associated fasteners. Post and beam corners will not be acceptable.

3. Butt Joints: All mechanically fastened butt joints shall be secured with hidden fasteners and internal FRP tube blocking.

4. Hardware Reinforcements: FRP reinforcing shall be chemically welded to fixed sash and window frame material at required locations. Mechanically fastened reinforcements are not permitted.
5. Anchors:
    a. BOLT-IN: Provide manufacturer's required number of 3/8" diameter x 4" long flat head stainless steel sleeve anchors for masonry openings, 3/8" diameter x 4" machine screw with nut and washers for structural steel openings, #14 x 4" stainless steel flat head sheet metal screws for wood or steel stud openings. Include extra anchors for additional frame height in two foot increments above 8'-0". Provide single bolt anchor at center of all headers over four feet in nominal width. Stainless Steel fasteners shall be furnished by the factory.
    b. GROUT-IN: Provide manufacturer's required number of wire or strap type masonry anchors for installation into block wall. Fill frame cavity with grout.

6. Finish: Fixed sash shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Industrial urethane chemical coating color topcoat, to match the color and sheen of the doors, for superior weatherability. Gelcoat may not be sprayed onto the frame as a secondary coating.

B. Fire rated FRP Fixed Sashes:
1. Design: Fire rated FRP fixed sash furnished under this specification shall utilize a high-modulus pultruded structural FRP shape. Standard frame profile is a double rabbeted 5¾" depth x 2" face, 3/16" thick, with integral 5/8" doorstop. The minimum frame section shall be limited to a 4" jamb depth, 1" face. Four inch header and expanded profiles are acceptable. Frame cavities shall be filled with a proprietary fire resistant composite formulation with a minimum density of 25 lb/ft^3. Hollow metal or Stainless Steel frames are not acceptable
2. Corner Joints: KD jambs and header shall be joined at corners via miter connections. Post and beam corners will not be acceptable.
3. Hardware Reinforcements: FRP reinforcing shall be chemically welded to fixed sash and window frame material at required locations. Mechanically fastened reinforcements are not permitted.
4. Anchors:
    a. Provide manufacturer's required number of 3/8" diameter x 4" long flat head stainless steel sleeve anchors for masonry openings, grouted wire anchors for grouted installations. Stainless Steel bolts shall be furnished by the factory.
5. Finish: Fixed sash shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Industrial urethane chemical coating color topcoat, to match the color and sheen of the doors, for superior weatherability. Gelcoat may not be sprayed onto the frame as a secondary coating.

2.03 MECHANICAL PROPERTIES AND TEST PERFORMANCE

A. Pultruded structural shapes shall exhibit the following minimum longitudinal coupon properties (per ASTM):
1. Tensile strength (D638) 30,000 psi
2. Comprehensive strength (D695) 30,000 psi
3. Flexural strength (D790) 30,000 psi
4. Flexural modulus (D790) 1,600,000 psi
5. Shear strength (D2846) 4,500 psi
6. Impact, notched (D256) 25 ft-lb/in
7. Barcol hardness (D2853) 50
8. Fire Resistance (E-84) Class I

B. Adhesive shall exhibit the following minimum coupon properties (per SAE)
   1. Tensile Strength (D882-83A modified) minimum 2000 psi
   2. 8 day 25º C at 100% humidity Cross Peel (SAE J1553) minimum 330 psi
   3. 7 day immersion in seawater Cross Peel (SAE J1553) minimum 330 psi
   4. 30 day immersion in saltwater Cross Peel (SAE J1553) minimum 330 psi
   5. 72 hour immersion in gasoline Cross Peel (SAE J1553) minimum 330 psi
   6. 72 hour immersion in 20% sulfuric acid Cross Peel (SAE J1553) minimum 300 psi

2.04 FASTENERS

A. All fasteners for all hardware shall be type 304 CRSS (18-8 series corrosion resistant stainless steel) with no exception. No carbon steel or aluminum components shall be used.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. Factory mark all fixed sashes using a chemical resistant plastic tag or indelible marker with identifying number, keyed to shop drawings, prior to shipment.

3.02.1 INSTALLATION

A. Fixed Sash: Install in strict accordance with manufacturer's printed instructions. Set plumb and square, using shims for bolt-in of existing openings, or wood bracing prior to grouting of jambs. Use at least two 2x6 wood spreaders inside frame to maintain critical opening dimensions during grouting.

B. Glazing: Install glazing per industry standard methods and procedures. Glass, gasketing and glazing blocks will be furnished by others and field installed unless quoted as factory furnished.

3.03 CLEANING

A. Clean exposed surfaces of FRP doors and frames with a mild, non-abrasive cleaner and water.

END OF SECTION

SECTION 08 5680 - ALUMINUM PASS-THRU SLIDING SERVICE WINDOWS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:
   1. Aluminum, medium-duty commercial sliding service windows as indicated in drawings and in sections.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's technical product data substantiating that product comply.
B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage
B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S

A. Basis of design: Design is based on (SW) Series, Aluminum Frame Sliding Service Windows manufactured by:

C.R. Laurence Co., Inc. (CRL)
(800) 421-6144
www.crlaurence.com

SECTION 08 5680 - ALUMINUM PASS-THRU SLIDING SERVICE WINDOWS

2.02 MATERIALS

A. Frames: Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Window glides on top-hung nylon slides. Poly-pile weather stripping and slide locks. Overall frame sizes are to be in accordance with the contract drawings.
B. Finish: Clear Anodized Aluminum
C. Glazing: 1/2" Tempered
D. Options: Provide keyed lock for sliding window.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical door hardware

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. "Metal Doors and Frames"
    b. "Flush Wood Doors"
    c. "Stile and Rail Wood Doors"
    d. "Interior Aluminum Doors and Frames"
    e. "Aluminum-Framed Entrances and Storefronts"
    f. "Stainless Steel Doors and Frames"
    g. "Special Function Doors"
    h. "Entrances"

6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Door Hardware Schedule:

   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.

6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.

3. Key Schedule:

a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Final approved hardware schedule edited to reflect conditions as installed.
d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

a. Fire door assemblies, in compliance with NFPA 80.
b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
   1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2) Preliminary key system schematic diagram.
   3) Requirements for key control system.
   4) Requirements for access control.
   5) Address for delivery of keys.

2. Pre-installation Conference

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Inspect and discuss preparatory work performed by other trades.
c. Inspect and discuss electrical roughing-in for electrified door hardware.
d. Review sequence of operation for each type of electrified door hardware.
e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty
1) Locks
a) Schlage ND Series: 10 years
2) Exit Devices
a) Von Duprin: 10 years
3) Closers
a) LCN 4050 Series: 25 years
b) LCN 1250 Series: 15 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
B. Approval of products is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Ives 5BB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage ND series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
b. Lever Design: RHO.

2.05 DEADBOLTS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage B600/B700/B800 Series

B. Requirements:

1. Provide grade 1 deadbolt series conforming to ANSI/BHMA A156.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide deadbolts with standard 2-3/4 inches (70 mm) backset. Provide 2-3/8 inches (60 mm) where noted or if door or frame detail requires. Provide deadbolt with full 1-inch (25 mm) throw, constructed of steel alloy.
4. Provide manufacturer's standard strike.

2.06 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Von Duprin 99/33A series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.07 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Schlage Everest 29 S to match owner’s keying system.

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer’s series as indicated. Refer to “KEYING” article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Conventional Patented Open: cylinder with permanent core with open keyway.
    b. Conventional Patented Open: cylinder with interchangeable core with open keyway.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.08 KEYING

A. Scheduled System:

1. New factory registered system:

a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:

a. Replaceable Construction Cores.
1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
a) 3 construction control keys
b) 12 construction change (day) keys.
2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

d. Identification:
1) Identification stamping provisions must be approved by the Architect and Owner.
2) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
3) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
4) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core.

2) Permanent Control Keys: 3.
3) Master Keys: 6.

2.09 KEY CONTROL SYSTEM

A. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

    a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    b. Provide hinged-panel type cabinet for wall mounting.

2.10 DOOR CLOSERS (EXTERIOR & AREAS AS SCHEDULED)

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. LCN 4050A series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.11 DOOR CLOSERS (INTERIOR)

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. LCN 1250 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-3/8-inch (35 mm) diameter with 5/8-inch (16 mm) diameter pinion journal diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Pressure Relief Valve (PRV) Technology: Not permitted.
7. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.13 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

a. Glynn-Johnson

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.15 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.17 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.18 FINISHES

A. FINISH: As Scheduled.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items per manufacturer's instructions to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
D. Hardware Sets:

129465 OPT0413618-V1

HARDWARE SET # 001

For use on Door #(s):
A100-2 *A100-3* *A102-2* *A102-3* *A115-2* *A115-3*

EACH RU DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CYLINDER	AS REQUIRED		626	SCH
1	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA		BALANCE OF HARDWARE BY DOOR MFR			

COORDINATE HARDWARE / LOCKING REQUIREMENT WITH OVERHEAD DOOR MFR.

HARDWARE SET # 207W

For use on Door #(s):
A101-1

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA	OH STOP	900S SERIES		630	GLY
1	EA	SURFACE CLOSER	1250 RW/PA SLIMPC X MTG PLT/SPCR/BRKT AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)		BK	ZER

HARDWARE SET # 553

For use on Door #(s):
A102-1

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM SECURITY	ND75TD RHO XN12-035		626	SCH
2	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET # 553S

For use on Door #(s):
A104-1 *A104-2*

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM SECURITY	ND75TD RHO XN12-035		626	SCH
2	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA	OH STOP	900S SERIES		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET # 715

For use on Door #(s):
A100-1 *A115-1*

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	99-NL-SNB		626	VON
1	EA	RIM CYLINDER	20-057 ICX W/CONST. CORE		626	SCH
1	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT X MTG PLT/BRKT/SPCR AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT AT COVERED AREAS)		AA	ZER
1	EA	GASKETING SET	188S PSA H & J		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	65A		A	ZER

HARDWARE SET # 801CL

For use on Door #(s):
A105-1 *A107-1*

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM DEADBOLT	B663T 12-631		626	SCH
1	EA	FSIC CORE	23-030 CKC EV29 S		626	SCH
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	1250 SCUSH SLIMPC X MTG PLT/SPCR/BRKT AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET # 801E

For use on Door #(s):
A106-1 *A108-1*

EACH SGL DOOR TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	1250 EDA SLIMPC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

END OF SECTION

SECTION 088000 - GLASS AND GLAZING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials used to install glass. Types of work in this section include glass and glazing for:

Window wall/store front construction, safety or tempered glass.

Entrances and other doors, safety or tempered glass.

"Glass Products" is hereby defined to include glazing plastics.

Packaged mirror units are specified as "specialties" in another section.

QUALITY ASSURANCE:

Prime Glass Manufacturer: One of the following for each type/color/pattern of glass:

ASG Industries, Inc.
C E Glass Division
Ford Glass Company
PPG Industries, Inc.

Prime Glass Standard: FS DD G 451

Heat Treated Glass Standard: FS DD G 1403

Safety Glass Standard: CPSC 16 CFR 1201.

The contractor shall submit shop drawings and test reports indicating the proposed window and exterior door assemblies meet the noted project design wind pressure requirements as defined by the Structural Engineer.

SUBMITTALS:

JOB CONDITIONS:
Pre Installation: Meet with Glazier and other trades affected by glass installation, prior to beginning of installation. Do not perform work under adverse weather or job conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommended by manufacturer.

PART 2 - PRODUCTS

GLASS PRODUCTS:

INSULATED GLASS UNITS:
Manufacturer is used in this section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced standards.
1. Oldcastle Glass®
2. Guardian Industries
3. Pilkington
4. PPG Industries
5. ACH Float Glass

Materials
Sealed insulating glass units. The sealed insulating glass unit is comprised of (2) ¼" glass lite units separated by a ½" desiccant-filled spacer system. Total thickness of 1".

1. Insulating Glass Unit Make-up (Solarban 70 XL)
    - Outboard Lite ¼"
        1. Glass Type: Low-E Coated
        2. Glass Tint: Clear
        3. Glass Strength: (Heat-Strengthened or Tempered)
        4. Coating Orientation: Surface #2
    - Spacer
        1. Nominal Thickness: ½"
        2. Gas Fill: Air
    - Inboard Lite ¼"
        1. Glass Type: Uncoated
        2. Glass Tint: Clear
        3. Glass Strength: (Annealed, Heat-Strengthened or Tempered)
        4. Coating Orientation: NA

2. Performance Characteristics (Center of Glass)
(Note: Verify that the glass type and thickness specified matches the Performance Characteristics listed below.)
    - Visible Transmittance: 64%
    - Visible Reflectance: 12%
    - Winter U-Factor (U-Value): 0.28
    - Shading Coefficient (SC): 0.27
    - Solar Heat Gain Coefficient (SHGC): 0.32

3. Provide hermetically sealed IG units with dehydrated airspace, dual sealed with a primary seal of polyisobutylene (PIB), or thermo plastic spacer (TPS) and a secondary seal of silicone or an organic sealant depending on the application.

FABRICATED GLASS UNITS: At all door lites and interior windows
Laminated Safety Glass (Lmn-G-Sft): Laminate 2 sheets of clear float glass with a 30-mil film of polyvinyl buteral, by manufacturer's standard heat-plus-pressure process with dirt, air pockets and foreign substances excluded; 1/4" thick if not otherwise indicated.
Color: Clear

PROCESSED GLASS:

Tempered Glass, Tempered Glass Mirrors: Provide prime glass of color and type indicated, which has not been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength. Tempered glass is to be provided at all glass areas opening onto corridors and hallways.

GLAZING SEALANTS AND COMPONENTS:

General: Provide color of exposed sealant/compound indicated or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the locations of each application, conditions at time of installations, and performance requirements as indicated. Select materials and variations or modifications, carefully for compatibility with surfaces contacted in the installation.

Butyl Rubber Glazing Sealant (BUR GS): Compound of polymerized butyl rubber and inert fillers, solvent based, 75% solids, complying with FS TT S 001657; tack free in 24 hrs. paintable, non-staining.

Preformed Butyl Rubber Glazing Sealant (PBuR GS): Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper; tack free in 24 hrs., paintable, non-staining; plain, pre-shimmed or reinforced as required for proper installation and setting of glass.

Oleo Resinous Glazing Compound (OR GC): Oil based glazing compound; non-staining and non-bleeding; provide proper type as required for either channel or face glazing; comply with FS TT G 410 for face glazing compound.

GLAZING GASKETS:

Structural Rubber Glazing Gaskets (StR GG): Neoprene extrusions fabricated into frames with molded corner units and zipper lock strips; comply with ASTM C 542.

Molded Neoprene Glazing Gaskets: (MN GG): Molded or extruded neoprene gaskets of the profile and hardness required for water tight construction; comply with ASTM D 2000 designation 2BC 415 to 3BC 620, black.

MISCELLANEOUS GLAZING MATERIALS:
Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

Setting Blocks: Neoprene or EPDM, 70 90 durometer hardness, with proven compatibility with sealants used.

Spacers: Neoprene or EPDM, 40 50 durometer hardness with proven compatibility with sealants used.

PART 3 EXECUTION

STANDARDS AND PERFORMANCE:
Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading,

impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual", except where more stringent requirements are indicated.

PREPARATION FOR GLAZING:

Clean glazing channel and other framing members immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

GLAZING:

Install setting blocks of proper size in sill rabbet, located 1/4th of glass width from each corner. Set blocks in thin course of hell bead compound, if any.

Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or pre-shimmed tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in channel at heel of jambs and head (do not leave voids in still channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

Force sealants into channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.

Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

Gasket Glazing: Miter out and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in glazing system.

Structural Gasket Glazing: Cut zipper strips slightly long, to ensure tight closure. Lubricate zipper strip and use special tool to install zipper. Do not lubricate glazing channel or anchorage rabbed. Comply with details as shown and manufacturer's instructions, including the possible use of liquid sealants and weep holes.

CURE PROTECTION AND CLEANING:

Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.

Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION 088000

SECTION 092600 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 General Requirements sections, apply to work of this section.

DESCRIPTION OF WORK:

Types of work include:

Gypsum drywall including screw type metal support system

Drywall finishing (joint tape and compound treatment)

Gypsum Sheathing

QUALITY ASSURANCE:

Fire Resistance Rating: Where gypsum drywall systems with fire resistance ratings are indicated or are required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL and AIA.

Gypsum Board Terminology Standard: GA 505 by Gypsum Association.

Single Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

DELIVERY, STORAGE AND HANDLING:

Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

PROJECT CONDITIONS:

Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F (13 degree C) maintain continuous, uniform, comfortable building working temperatures of not less than 55 degree F (13 degree C) for a minimum period of 48 hours prior to, during and following application of gypsum bard and joint treatment materials or bonding of adhesives.

Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

Metal Support Materials:

Gold Bond Building Products Div., National Gypsum Co.
Milcor Division; Inryco Inc.
United States Gypsum Co.

Direct Suspension Systems:

Chicago Metallic Corp.
Donn Corporation.
National Rolling Mills Co.
Roblin Building Products, Inc.
United States Gypsum Co.

Gypsum Board and Related Products:

Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.

METAL SUPPORT MATERIALS:

Ceiling Support Materials and Systems:

General: Size ceiling support components to comply with ASTM C 754 unless indicated otherwise, hot dipped galvanized at exterior walls.

Main Runners: Steel channels with rust inhibitive paint finish, hot or cold rolled.

Hanger Wire: ASTM A 641, soft, Class 1 galvanized.

Hanger Anchorage Devices: Screws, clips, bolts, cast in place concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported except size direct pull out concrete inserts for 5x calculated loads.

Furring Members: ASTM C 645; 0.0179" min. thickness of base metal, hat shaped.

Where shown as "Resilient", provide manufacturer's special type designed to reduce

sound transmission.

Furring Members: ASTM C 645; 0.0179" min. thickness of base metal, C shaped studs.

Furring Anchorages: 16 gage galvanized wire ties, manufacturer's standard wire type clips, bolts, nails or screws as recommended by furring manufacturer and complying with C 754.

Direct Suspension Systems: Manufacturer's standard zinc coated or painted steel system of furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended.

Wall/Partition Support Materials:

Exterior Studs: Refer to Structural

Interior Studs: Refer to schedule in Section 3.2.

Depth of Section: 6", except as otherwise indicated.

Deflection System: Provide Slotted Deflection Track at all interior partitions.

Suspended Drywall System: Equal to Armstrong Drywall Grid System

Shaft Wall System: Equal to USG Shaftwall System at elevator/mechanical shafts. Provide and install system with C-H profile studs.

Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

Furring Members: ASTM C 645; 0.0179" min. thickness of base metal, hat shaped. Where shown as "Resilient," provide manufacturer's special type designed to reduce sound transmission.

Z Furring Members: Manufacturer's standard screw type galvanized steel, zee shaped furring members; ASTM A 525, G60, 0.0179" min. thickness of base metal; of depth indicated; designed for mechanical attachment of insulation boards or blankets to monolithic concrete and masonry walls. Hot dipped galvanized at exterior walls.

Fasteners for Furring Members: Type and size recommended by furring manufacturer for substrate and application indicated.

2.1 GYPSUM BOARD PRODUCTS
A. Sizes: Maximum lengths and widths available that will minimize short edge-to-short edge butt joints
and to correspond to support system indicated.
B. Typical Paper-Faced Gypsum Board Products:
1. Paper-Faced Type X Gypsum Board:
a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
b. Description: Noncombustible fire resistant gypsum core with paper surfacing on face,back, and long edges; tapered long edges; 5/8 in (15 mm) thick.
c. Manufacturers and Products:
1) CertainTeed Corporation; ProRoc Type X Gypsum Board

2) Georgia-Pacific Gypsum LLC; ToughRock Fireguard Gypsum Board.
3) National Gypsum Company; Gold Bond Fire-Shield Gypsum board.
4) United States Gypsum Company (USG); Sheetrock Firecode Core.
5) USG SHEETROCK® BRAND FIRECODE® X PANELS

C. Moisture-Resistant Gypsum Board Products:

1. Moisture-Resistant Paper-Faced Gypsum Board:

a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.

b. Description: Enhanced moisture-resistant, noncombustible gypsum core, with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 5/8 in (15 mm) thick.

c. Manufacturers and Products:

1) CertainTeed Corporation; ProRoc Moisture and Mold Resistant Type X Gypsum Board.
2) National Gypsum Company; Gold Bond XP Gypsum Board.
3) ~~United States Gypsum Company (USG); Sheetrock Mold Tough Firecode Gypsum Board.~~
4) USG Sheetrock® Brand Mold Tough® Panels Firecode® X

2. Moisture-Resistant Paperless Glass-Mat Gypsum Board:

a. Material Quality Standard: ASTM C 1658 / C 1658M.

b. Description: Enhanced moisture-resistant, noncombustible gypsum core with inorganic, embedded fiberglass mat on both faces; square edges; score or 10 according to ASTM D 3273; 5/8 in thick.

c. Manufacturers and Products:

1) Georgia-Pacific Gypsum LLC; DensArmor Plus Fireguard Interior Guard.
2) National Gypsum Company; eXP Interior Extreme Gypsum Panels.
3) USG Durock™ Brand Glass-Mat Tile Backerboard moisture- and mold-resistant gypsum

3. Moisture-Resistant, Abuse-Resistant Gypsum Board Products:

a. Material Quality Standard: ASTM C 1629, Type X, and as follows:

1) Soft Body Impact Test: ASTM E 695, Classification Level 2.
2) Hard Body Impact Test: Annex A1, Classification Level 1.
3) Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274.

b. Paper-Faced Products: Specially formulated, noncombustible, gypsum core with heavy liner paper on back and smooth, heavy abrasive-resistant face paper on face and long edges; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8" thick.

1) Manufacturers and Products:

a) CertainTeed Corporation; Air Renew Extreme Abuse.
b) National Gypsum Company: Gold Bond Hi-Abuse XP Gypsum Board.

c. Paperless Products: Specially formulated, noncombustible, gypsum core with coated, fiberglass mat on both faces; manufactured to produce greater resistance to surface indentation and through-penetration than

typical gypsum panels; tapered long edges; 5/8 in thick

1) Manufacturers and Products:
   1) National Gypsum Company; Gold Bond eXP Interior Extreme AR Gypsum Panel.
   2) USG Corporation; Fiberock Interior Panel, Abuse Resistant.
   3) USG Sheetrock® Brand Mold Tough® VHI Firecode® X Panels

4. Moisture-Resistant Coated Glass-Mat Gypsum Board Products:
   a. Material Quality Standard: ASTM C 1178 / C 1178M.
   b. Description: Enhanced moisture-resistant, noncombustible, gypsum core with inorganic, embedded fiberglass mat on both sides; outside face coated with heat-cured copolymer water-resistant coating; square edges; score or 10 according to ASTM D 3273; 5/8 in thick.
   c. Manufacturers and Products:
      1) Georgia-Pacific Gypsum LLC; DensShield Tile
5. Moisture-Resistant type X Gypsum shaftliner panel:
   a. Material Quality Standard: ASTM C1658, C1396, ASTM E136, ASTM E84 .
   b. Description: noncombustible, moisture- and mold-resistant gypsum core that is encased in a moisture- and mold-resistant glass mat. The panels are UL Classified as to fire resistance (Type SLX) and feature double-beveled edges for easy installation.; score or 10 according to ASTM D 3273; 1 in thick.
   c. Manufacturers and Products:
      1) USG Sheetrock® Brand Glass-Mat Liner Panels Mold Tough®

2.2 FASTENERS

A. Limitations: Nails and staples are not permitted.

B. Fasteners for Attaching Metal Framing to Concrete Structure:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.
   a. Cast-in-place anchor, designed for attachment to concrete.
   b. Post-installed chemical anchor.
   c. Post-installed expansion anchor.
2. Powder-Actuated Fasteners: Suitable for application indicated, ANSI A 10.3; low velocity, powder-actuated fasteners; drive pins and clip angles fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, an ultimate load capacity not less than 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
3. Manufacturers:
   a. Construction Materials, Inc.
   b. Heckman Building Products, Inc.
   c. Hilti Corp.
   d. ITW Ramset/Red Head.
   e. Powers Fasteners.
   f. Simpson Strong Tie Anchor Systems.

C. Metal Framing Screws: Screw fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten metal framing and furring members securely to substrates involved; complying with recommendations of gypsum board manufacturers for applications indicated.
D. Gypsum Board Screws:
1. Material Quality Standards:
a. Metal Framing Members less than 0.03 in (0.75 mm) Thick: ASTM C 1002, Type S.

b. Metal Framing Members from 0.033 in to 0.112 in (0.79 mm to 2.9 mm) Thick:
ASTM C 954, Type S-12.
2. Product Description - Standard Applications: Bugle head, self-drilling, self-tapping, steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective gypsum board manufacturer; minimum 1 in (25 mm) long; with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
E. Miscellaneous Fasteners: For conditions not indicated, fasteners shall be type, finish, size, and holding power recommended by respective gypsum board manufacturer and conditions.

2.3 JOINT TREATMENT MATERIALS
A. Material Quality Standard: ASTM C 475 / C 475M.
B. Joint Tape:
1. Paper Tape: Nominal 2 in (50 mm) wide cross-fibered paper tape with finish suitable forbonding, creased in center for easy folding, and compatible with joint compound.
2. Mesh Tape: Nominal 2 in (50 mm) wide self-adhering 10-by-10 fiberglass mesh tape.
C. Joint Compound:
1. Setting-Type: Job-mixed powder for mixing with water, chemical-hardening compound; includes taping types.
2. Drying-Type: Ready-mixed or job-mixed powder for mixing with water, air-drying, vinyl based compounds; includes taping, topping, and all-purpose types.

2.4 TRIM ACCESSORIES
General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L type edge trim beads, U type edge trim beads, special L kerf type edge trim beads, and one piece control joint beads.

Corner bead and Edge Trim for Interior Installation: Comply with ASTM C 840 and the following:
Corner bead formed from zinc alloy, with flanges knurled and perforated or of fine mesh expanded metal.

Steel Edge trim formed from galvanized steel, types per Fig. 1 of ASTM C 840 as follows:

"LC" Bead, unless otherwise indicated.
"LK" Bead with square nose for use with kerfed jambs.
"L" Bead where indicated.

"U" Bead where indicated.

Plastic Edge Trim: Manufacturers standard rigid or semi rigid PVC moldings shaped to provide resilient contact of gypsum board edges with other construction; friction fit, or pressure sensitive adhesive mounting.

One Piece Control Joint: Formed with perforated face flanges connected by vee shaped slot, 1/4 inch wide by approximately 7/16 inch deep and covered with removable tape, fabricated from the following material:

Roll formed zinc.
Extruded vinyl.
Either roll formed zinc or extruded vinyl.

JOINT TREATMENT MATERIALS:

General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

Joint Tape: Paper reinforcing type.

Joint Compound: Vinyl type powder or ready mixed vinyl type for interior use.

Joint Compound: On interior work provide chemical hardening type for bedding and filling, ready mixed vinyl type or vinyl type powder for topping.

MISCELLANEOUS MATERIALS:

General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

Gypsum Board Screws: Comply with ASTM C 646.

Concealed Acoustical Sealant: Nondrying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant for concealed applications per ASTM C 919.

Sound Attenuation Blankets: Refer to Section 07201 for sound attenuation blanket specification.

Corner Guards: Refer to Section 10260 for Clear Corner Guard specification.

TEXTURE FINISH MATERIALS:
Primer: Of type recommended by manufacturer of texture finish.

Polystyrene Aggregated Finish: One of the following:

QT Imperial Texture Finish: United States Gypsum Co.
Perfect Spray: Gold Bond Bldg. Products Div.
Regular Texture
Light Monterrey
Medium Monterrey
Orange Peel

PART 3 EXECUTION

PREPARATION FOR METAL SUPPORT SYSTEMS
Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

INSTALLATION OF METAL SUPPORT SYSTEMS:

General:
Metal Support Installation Standard: Comply with ASTM C 754.

Do not bridge building expansion joints with support system, frame both sides of joints with furring and other support as indicated.

3.1. CEILING SUPPORT SUSPENSION SYSTEMS
Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated.

Space main runners 4' 0" o.c. and space hangers 4' 0" o.c. along runners, except as otherwise shown.

Level main runners to a tolerance of 1/8" in 12' 0", measured both lengthwise on each runner and transversely between parallel runners.

Wire tie or clip furring members to main runners and to other structural supports as indicated.

Space furring member 16" o.c., except as otherwise indicated.

Wall/Partition Support Systems:

Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction handbook" published by United States Gypsum Co.

Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.

Space studs 16" o.c., unless otherwise indicated.

Frame door openings to comply with detailed indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum

Com. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for jack studs) at head and secure to jamb studs.

Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

Frame openings other than door openings to comply with details indicated or if not indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
Space wall furring members 16" o.c., unless otherwise indicated.

Erect thermal insulation vertically and hold in place with Z furring members spaced 24" o.c. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails or power drive fasteners spaced 24" o.c. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring member channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12" from corner and cut insulation to fit. Until gypsum board is installed hold insulation in place with 10" staples fabricated from 18 gage tie wire and inserted through slot in web of member, or by an equally acceptable method.

3.2 METAL FRAMING SCHEDULE
A. Metal Stud Framing Schedule:
1. Stud Depth: As indicated on Drawings.
2. Spacing: Maximum 16 in (400 mm) on centers, unless otherwise indicated, or as required tocomply with respective assembly test report.
3. Minimum Performance Requirements - unless otherwise indicated:
a. Typical Partitions: L/240 at 5 lb/sq ft (239 Pa) lateral load
b. Elevator Shaft Partitions: L/240 at 7.5 lb/sq ft lateral load.
c. Partitions with Tile Facing: L/360 at 7.5 lb/sq ft (359 Pa) lateral load.
4. Minimum Uncoated Base Metal Thickness:
a. Typical Gypsum Board Assemblies: As determined by manufacturer's limiting height engineering data unless otherwise indicated.
1) 25 Gage or 25 Gage Equivalent Studs: Typical at partitions without wall-mounted components installed on either side.
3) 20 Gage or 20 Gage Equivalent Studs:
a) Partitions supporting ceramic tile.
b) Partitions with gypsum board on one side only.
c) At door jambs.
d) Partitions supporting wall hung cabinets or shelving.

3.3 GYPSUM BOARD SCHEDULE
A. Gypsum Board Schedule, General: Install the designated gypsum board product based on exposure classification to water and / or moisture and applied finish system as follows, unless otherwise indicated or scheduled on the Drawings.
B. No Exposure: Surfaces not normally exposed to water and / or moisture sources including but not limited to the following:
1. Typical walls and ceilings.
a. Paint and Wall Coverings Only: Typical paper-faced gypsum board.
b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.
2. Abuse-resistant walls as indicated in the Drawings:

a. Paint and Wall Coverings Only: Abuse-resistant paper-faced gypsum board.

C. Incidental Exposure: Surfaces immediately adjacent to water and / or moisture sources including, but not limited to, the following locations:

1. Top of walls above ceilings adjacent to mechanical equipment in corridors.
2. Walls and ceilings in mechanical equipment rooms and janitor closets.
3. Walls within 24 inches of centerline of drinking fountains, isolated wall-hung lavatories, and countertop sinks and other similar water sources.
4. Interior face of exterior walls.
5. Acceptable gypsum board products for the above listed conditions:
   a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.
   b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.
6. Abuse-resistant walls as indicated in the Drawings:
   a. Paint and Wall Coverings Only: Moisture Resistant abuse-resistant paper-faced gypsum board.

D. Direct Exposure: Surfaces normally soaked, saturated, or regularly and frequently exposed to water and / or moisture including, but not limited to, the following locations:

1. Walls and ceilings in toilet rooms and bathrooms including bathtubs and showers:
   a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.
   b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.

3.4 GYPSUM BOARD FINISHING SCHEDULE

A. Gypsum Board Finishing Schedule, General: Finish panels to Levels of Finish indicated below. Apply joint tape over panel joints, except those with trim having flanges not intended for tape. Sand between coats and after last coat to produce a surface free of defects and ready for applied finish system.

B. Preparation: Apply joint compound at open joints, panel edges, and damaged surface areas.

C. Level 1: At following locations, embed tape at joints in joint compound unless a higher level of finish is required for fire resistance rated assemblies:

1. Ceiling plenum areas above ceilings.
2. Concealed areas.

D. Level 2: At following locations, embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges:

1. Substrate for tiling.

E. Level 3: At following locations, embed tape and apply separate first and second coats of joint compound to tape, fasteners, and trim flanges:

1. Mechanical, electrical, data and elevator equipment rooms.

F. Level 4: At following locations, embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges:

1. Areas to receive paint.

G. Level 5: At following locations, embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound or Level 5 Primer and Surfacer over entire surface:

1. Areas indicated on drawings

3.5 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216.

Where handrails are indicated for direct attachment to gypsum board shaft wall system, provide not less than a 0.0341 inch thick by 4 inch wide galvanized steel reinforcement strip, accurately positioned and secured behind not less than one gypsum board face layer of 1/2 inch or 5/8 inch thickness.

Install sound attenuation blankets as indicated, prior to gypsum board unless readily installed after board has been installed.

Locate exposed end butt joints as far from center of walls and ceilings as possible, and stagger not less than 1' 0" in alternate courses of board.

Install ceiling boards in the direction and manner which will minimize the number of end butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1' 0".

Install wall/partition boards vertically to avoid end butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

Located either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill cut or field cut ends against mill cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are properly braced internally.

Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.

Isolate perimeter of non load bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J type semi finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.

For double layer partition system, work above acoustical ceilings may be installed with base layer only.

Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.6 METHODS OF GYPSUM DRYWALL APPLICATION

Single layer Application: Install gypsum wallboard.

On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.

On partitions/walls apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

Double Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

Fasten base layers to supports with screws. Stagger joints on face layers.

3.7 INSTALLATION OF DRYWALL TRIM ACCESSORIES

General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

Install metal corner beads at external corners of drywall work.

Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi finishing type is indicated. Install L type trim where work is tightly abutted to other work, and install special kerf type where other work is kerfed to receive long leg of L type trim. Install U type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints).

Install plastic edge trim where indicated on wall panels at juncture with ceilings.

Install metal control joint (beaded type) at all wall openings, at interior structural members and intervals not to exceed 30’-0”, and where indicated otherwise.

3.8 FINISHING OF DRYWALL

General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Pre-fill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.

Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.

Apply joint compound in 3 coats (not including pre-fill of openings in base), and sand between last 2 coats and after last coat.

Refer to sections on painting, coatings and wall coverings in Division 9 for decorative finishes to be applied to drywall work.

3.9 APPLICATION OF TEXTURE FINISH

Surface Preparation and Primer: Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer of proper type to all surfaces to receive texture finish.

Finish Application: Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture without starved spots or other evidence of thin application, and free of application patterns.

Remove any texture droppings or overspray from door frames, windows and other adjoining work.

3.10 PROTECTION OF WORK:

Installer shall advise Contractor of required procedures for protecting gypsum drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 09250

SECTION 093013 - TILE

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.

Extent of tile work is indicated on drawings and schedules.

Types of tile work in this section include the following:

- Glazed Ceramic Tile
- Colorbody Porcelain Tile
- Waterproofing Membrane
- Stone Thresholds
- Metal Edge Strips

QUALITY ASSURANCE:
Source of Materials: Provide materials obtained from one source for each type and color of tile, grout and setting materials.

SUBMITTALS
Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.

Samples for Initial Selection Purposes: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors, textures and patterns available for each type of tile specified. Include samples of grout and accessories requiring color selection.

Samples for verification purposes: Submit the following:

Samples for each type of tile and for each color and texture required, not less than 12" square, on plywood or hardboard backing and grouted.

Full size samples for each type of trim, accessory and for each color.

Certification: Furnish Master Grade Certificate for each shipment and type of tile, signed by manufacturer and Installer.

PRODUCT HANDLING:
Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

PROJECT CONDITIONS:
Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

Maintain temperatures at not less than 50 deg.F (10 deg.) in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 PRODUCTS

ACCEPTABLE MANUFACTURERS:
Available Manufacturers:

Glazed Ceramic Tile and Porcelain:
Basis of Design: Daltile
American Olean Tile Co., Div., National Gypsum Co.

Dry Set Grouts: (Non staining)
Custom Building Products.
Laticrete International Inc.
L & M Surco Mfg., Inc.

Commercial Portland Cement Grout: (Non staining)
Custom Building Products.
L & M Surco Mfg. Co., Inc.
TheUpco Co.

PRODUCTS, GENERAL:
ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

Colors, Textures and Patterns: For tile, grout and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match Characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standards.

Provide tile trim and accessories which match color and finish of adjoining flat tile.

Mounting: Where factory mounted tile is required provide back or edge mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

TILE PRODUCTS:
Colorbody Porcelain Tile (Floor): Provide factory mounted flat tile complying with the following requirements:
Type: Porcelain
Series: Portfolio
Nominal Facial Dimensions: 11-3/4” x 23-3/4” (12”x24”)
Color: Ash Grey PF05

Glazed Ceramic Tile (Wall): Provide factory mounted flat tile complying with the following requirements:

Type: Glazed Ceramic
Series: Color Wheel Linear Collection
Nominal Facial Dimensions: 4" x 12”
Finish: Semi-Gloss
Pattern: Manufacturers Standard
Color: Artic White 0190; Desert Gray X114; Black K111 and Emerald 0115 (Type 1-40%, Type 2-35%, Type 3-25%)

Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

SETTING MATERIALS:
Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

Thin set Portland Cement Mortar: Where thin set portland cement mortar applications are indicated, use the following unless otherwise required.

Dry Set Portland Cement Mortar: ANSI A108.5, factory sanded; or latex portland cement mortar, ANSI A108.4.

Organic Adhesive: ANSI A136.1; use Type I for showers, tub recesses, or other areas requiring prolonged water resistance, Type II elsewhere, unless indicated. Provide primer sealer where recommended by manufacturer.

GROUTING MATERIALS:
Commercial Portland Cement Grout: Proprietary Pre-blended compounded composed of portland cement and additives formulated for the type of tile installed.

Dry Set Grout: Proprietary compound composed or portland cement and additives formulated for type of tile installed.

Grout for Pre-grouted Tile Sheets: Same elastomeric material used in factory pre-grouted sheets.

Colors to be selected by Architect form manufacturer’s standard colors.

MISCELLANEOUS MATERIALS:
Metal Edge Strips: Zinc alloy or stainless steel, 1/8" wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

Tile Cleaner: DuPont StoneTech Professional Stone & Tile Cleaner

Tile Sealer: DuPont StoneTech Professional Heavy-Duty Grout Sealer.

THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

    1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface

of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C1353 or ASTM C241/C241M and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.

C. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver exposed-edge material.

WATERPROOFING MEMBRANE

A. Schulter-KERDI Membrane - Refer to Specification Section 093050.

PART 3 - EXECUTION

INSPECTION:
Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

INSTALLATION, GENERAL:
ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".

TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

Grout tile to comply with referenced installation standards, using grout materials indicated.

FLOOR INSTALLATION METHODS:

Ceramic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of sub-floor construction, and grout types:

Portland Cement Mortar: ANSI A108.1.

Bond Coat: Portland cement paste on plastic bed or thin set portland cement on cured bed, ANSI A108.5; at Contractor's option.

Concrete Sub-floors, Interior, Waterproofing Membrane: TCA F121.

Mortar: Sand portland cement

Thin set Portland Cement Mortar: ANSI A108.5

Concrete Sub-floors; Interior: TCA F113.

Grout: Sand portland cement

Conductive Ceramic Mosaic Tile: Install to comply with ANSI A108.7 using conductive dry-set mortar bond coat on damp cured and dried portland cement mortar bed as per TCA F112; grout type as indicated below:

Grout: Sand-portland cement

Paver Tile: Install tile to comply with requirements indicated below for setting bed method, TCA installation method related to types of sub-floor construction, and grout types:

Portland Cement Mortar: ANSI A108.1

Concrete Sub-floor, Interior: TCA F112 (bonded)

Grout: Sand-portland cement.

Metal Edge Strips: Install at locations indicated or where exposed edge of the flooring meets carpet, wood or other flooring which finishes flush with top of tile.

WALL TILE INSTALLATION METHODS:

Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

Grout: Dry set.; Thin-set Portland Cement Mortar: ANSI A108.5.

Interior; TCA W213

CLEANING AND PROTECTION:

Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

Unglazed tile may be cleaned with acid solution only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile work.

Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is

completed.

Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

Seal grout in all areas receiving ceramic tile finish.

END OF SECTION 09300

SECTION 093050 - TILE SETTING MATERIALS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Waterproofing Membrane.

1.2 RELATED SECTIONS

A. Section 09 30 00 - Tiling.

1.3 REFERENCES

A. CSA B79-08: Floor, Area, and Shower Drains, and Cleanouts for Residential Construction.

B. IAPMO IGC 195: Interim Guide Criteria for Floor Drain with Integrated Bonding Flange.

C. Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation.

D. Terrazzo, Tile and Marble Association of Canada (TTMAC) Specification Guide 09300 Tile Installation Manual.

E. American National Standard Specifications for the installation of ceramic tile A108 / A118 / A136.1.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years' experience.

B. Source Limitations for Setting Materials and Accessories: Obtain product of a uniform quality for each application condition from a single manufacturer.

C. Preinstallation Conference: Conduct conference at the Project site.
1. Convene one week prior to commencing work of this section.
2. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
3. Meeting agenda includes but is not limited to:
a. Surface preparation.
b. Tile and installation material compatibility.

c. Edge protection, transition and pre-fabricated movement joint profiles.
d. Waterproofing techniques.
e. Crack isolation techniques.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. ASD. Tel: (800) 472-4588. Fax (800) 477-9783. E-mail:specassist@schluter.com. Web:www.schluter.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 WATERPROOFING MEMBRANE

A. Schluter-KERDI
1. Description: 0.008 inch (0.2 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which is listed by cUPC to meet or exceed requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).
2. Corners and seals:
a. Provide matching preformed inside corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 095100 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Extent of each type of acoustical ceiling is shown and scheduled on drawings.

Types of acoustical ceilings specified in this section include the following:
Acoustical panel ceilings, exposed suspension.

QUALITY ASSURANCE:
Installer Qualifications: Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire suppression system components (if any), and partition system (if any).

SUBMITTALS:
Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.

DELIVERY, STORAGE, AND HANDLING:
Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

PROJECT CONDITIONS:
Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

ACOUSTICAL CEILING UNITS, GENERAL:
Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS S 118 requirements, including those indicated by reference to type,

form, pattern, grade (NRC or NIC's as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).

Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1 II "Ceiling Sound Transmission Test by Two Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).

Colors, Textures, and Patterns: Provide products to match appearance characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

ACOUSTICAL PANELS:
SAC Panels - Other (Panel Material as indicated below).
High Density Ceramic Composition Units with Scrubbable Finish: Resistant to heat, moisture, and corrosive fumes; suitable for exterior applications; Pattern/NRC as indicated below; LR1 (0.75); square edge, white, 24" X24" X 5/8" or as indicated.
Provide locking hold down clips at all Restrooms and Lockers
56644 USG Radar Ceramic Acoustical Panels

Upon completion of project, the Contractor shall provide the Owner with two boxes of ceiling tile for each style used for future repairs.

METAL SUSPENSION SYSTEMS, GENERAL:
Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

Finishes and Colors: Provide manufacturer's standard finish for type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide black color.

High Humidity Finish: Comply with ASTM C 635 requirements for Coating Classification for "Severe Environment Performance" where high humidity finishes are indicated.

Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct-Hung.

Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3 times hanger design loan (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.

Edge Moldings and Trim: Metal or extruded plastic of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

Available Manufacturers: Manufacturers of Steel Exposed Suspension Systems: (in air-conditioned areas)
Same as acoustical unit manufacturer:
Chicago Metallic Corp.
Donn Corp.
National Rolling Mills, INc.

EXPOSED METAL DIRECT HUNG SUSPENSION SYSTEM:
Fire Rated Double Web Suspension System: 15/16” USG Donn DX/DXL
Finish: Aluminum cap painted white.

Structural Classification: Intermediate Duty System: 15/16” USG Donn DX/DXL
Finish: Aluminum cap painted white.

Structural Classification: Intermediate Duty System: 9/16” USG Donn DXT
Finish: Aluminum cap painted white.

USG Drywall Suspension System Flat Ceilings DGLW26 and DGLW424

PART 3 - EXECUTION

PREPARATION:
Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans wherever possible.

INSTALLATION:
General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.

Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.

Install tile with pattern running in alternating one direction.

Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" along each carrying channel or direct hung runner, unless otherwise indicated, leveling to tolerance of 3/32" in 12'-0".

Secure wire hangers by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
.
Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter splaying or other equally effective means.

Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

Screw attached moldings to substrate at intervals not over 16” o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12' 0". Miter corners accurately and connect securely.

Install acoustical tile in coordination with suspension system. Place splines or flanges of

suspension system into kerfed edges, or insert tile tongues into tile grooves, so that every tile to tile joint is closed by double lap of material.

Fit adjoining tile to form flush, tight joints. Scribe and cut for accurate fit at borders and around penetrating work.

Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

ADJUST AND CLEAN:
Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09510

SECTION 09650 - RESILIENT FLOORING

PART 1 - GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Extent of accessories is shown on drawings and in schedules.

QUALITY ASSURANCE:
Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

Wherever possible, provide required resilient flooring and accessories produced by a single manufacturer.

SUBMITTALS:
Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.

Samples: Submit, for verification purposes, samples of each type, color, and pattern of resilient flooring, including accessories, required, indicating full range of color and pattern variation.

Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

Replacement Material: After completion of work, deliver to project site replacement materials from same manufactured lot as materials installed, and as follows:

Tile flooring, not less than one box for each 50 boxes or fraction thereof, for each type, size, and color installed.

JOB CONDITIONS:
Maintain minimum temperature of 65 degrees F (18 degrees C) in spaces to receive resilient flooring for at least 40 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed.

Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:

Rubber Wall Base:
Basis of Design: Flexco Floors
Selected Color: Manufacturers Full Range – To match Existing

Johnson Rubber Co., Inc., Flooring Accessories Div.
Roppe Rubber Corp.

MATERIALS:
Colors and Patterns: As shown or scheduled, or as selected by Architect from manufacturer's standards.

Accessories:
Basis of Design: Wall Base equal to Flexco #2000 – Color: Manufacturer Full Range
Wall Base (WL BS): Provide rubber base complying with FS SS W 40, Type I, with matching end stops and preformed corner units, and as follows:
Height: 4".
Thickness: 1/8" gage.
Style: Standard top set cove.
Finish: Matte.

Transition strip:
Provide 1" wide transition strips between all differing floor conditions.
Provide 1" transition strips at all door openings.

Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

Concrete Slab Primer: Non staining type as recommended by flooring manufacturer.

Leveling Compound: Latex type as recommended by flooring manufacturer.

PART 3 - EXECUTION

PREPARATION:

Broom clean or vacuum surfaces to be covered and inspect sub-floor. Start of flooring installation indicates acceptance of sub-floor conditions and full responsibility for completed work.

Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in sub-floors.

Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring.

Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

INSTALLATION:

General:
Install flooring using method indicated in strict compliance with manufacturer's

recommendations. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other non-permanent marking device.

Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas.

Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

Tightly cement flooring to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

Tile Floors:
Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room is of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.

Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles.

Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

Accessories:
Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with metered or coped inside corners. Tightly bond tile to substrate throughout length of each piece to provide continuous contact at horizontal and vertical surfaces.

On masonry surfaces, or other similar irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which, when changed to different floor material, would otherwise be exposed.

CLEANING AND PROTECTION:
Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.

Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.
END OF SECTION 09650

SECTION 099000 PAINTING

PART 1 GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work in this section.

DESCRIPTION OF WORK:
Extent of painting work is indicated on drawings and schedules, and as herein specified.

Work includes painting and finishing of interior and exterior exposed items and surfaces throughout Project, except as otherwise indicated.

Surface preparation, priming and coats or paint specified are in addition to shop priming and surface treatment specified under other sections of work.

"Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Paint exposed surfaces whether or not colors are designated in “schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors available for materials systems specified.

Pre Finished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, pre-finished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets, elevator entrance frames, doors and equipment.

Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.

Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, and motor and fan shafts will not require finish painting.

Do not paint over any code required labels, such as Underwriters’ Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

SUBMITTALS:

Product Data: Submit manufacturer's technical information including Paint label analysis and application instructions for each material proposed for use.
Samples: Submit samples for Architect's review of color and texture only. Provide a listing of

material and application for each coat of each finish sample.

On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.

On concrete masonry, provide two 4" square samples of masonry for each type of finish and color, defining filler, prime and finish coat.

DELIVERY AND STORAGE:
Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

Name or title of material.
Fed. Spec. number, if applicable.
Manufacturer's stock number and date of manufacture.
Manufacturer's name.
Contents by volume, for major pigment and vehicle constituents.
Thinning instructions.
Application instructions.
Color name and number.

JOB CONDITIONS:

Apply water base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Apply solvent thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 PRODUCTS

COLORS AND FINISHES:

Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.

Prior to beginning work, Architect will furnish color chips for surfaces to be painted.

Use representative colors when preparing samples for review.

MANUFACTURERS: for interior paint system only;

Sherwin Williams
Technical Coatings Inc.
Jones Blair
Pittsburgh Paint

for exterior paint system;
Tnemec (no substitutes for this product)

Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

MATERIALS:

Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best grade product will not be acceptable.

EXTERIOR PAINT SYSTEMS (EPS):

Provide following paint systems for various substrates, as indicated.

General Paint Wood:

EPS-1 1st coat - Primer undercost (T-P-25).
2nd coat - Acrylic emulsion (TT-P-19).
3nd coat - Acrylic emulsion (TT-P-19).

Painted Wood Trim:

EPS-2: 1st coat - Primer undercoat (TT-P-25).
2nd coat - Alkyd trim enamel (TT-P-37).
3rd coat - Alkyd trim enamel (TT-P-37).

Painted Plywood:

EPS-3 1st coat - Surface sealer (TT-S-176).
2nd coat - Primer undercoat (TT-P-25).
3rd coat - Acrylic emulsion (TT-P-19).
4th coat - Acrylic emulsion (TT-P-19).

EXTERIOR CMU

1st Coat - TNEMEC Series 130 Envirofill 60-85SFPG
2nd Coat and 3rd Coat - TNEMEC Series 157 Enviro-Crete TX 99-111 SFPG

EXPOSED STRUCTURAL STEEL AND ACCESSORIES

Surface Preparation: Commercial Blast Cleaning as per SSPC-SP6. Note do not use this paint

system if surface has been hot dipped galvanized.

Coating System:

Primer:	Tnemec Series 90-97 Tneme-Zinc	2.5 - 3.5 dry mils
First Coat:	Tnemec Series 27WB Typoxy	4.0 - 6.0 dry mils
Finish Coat:	Tnemec Series 740 UVX	3.0 - 5.0 dry mils

EXPOSED STRUCTURAL STEEL AND ACCESSORIES

Surface Preparation: Abrasive blast as per ASTM D 6386 providing a minimum 1.5 mil angular anchor profile.

Coating System:

First Coat:	Tnemec Series 27WB Typoxy	4.0 - 6.0 dry mils
Finish Coat:	Tnemec Series 740 UVX	3.0 - 5.0 dry mils

INTERIOR PAINT SYSTEMS:

Provide following paint systems for various substrates, as indicated.

Epoxy Floor System: with broadcast sand aggregate.

1st Coat - Tneme Series 287 Enviro-Pox	2.0 – 4.0 dft
2nd Coat- Tneme Series 287 Enviro-Pox	2.0 – 4.0 dft

Concrete Masonry units (Epoxy Coating):

IPS2: 1st Coat - Heavy Duty Block Filler
2nd Coat- Waterbased Tile Clad Epoxy
3rd Coat - Waterbased Tile Clad Epoxy

Concrete Masonry units:

IPS2: 1st Coat - PROMAR Interior/Exterior Block Filler
2nd Coat- PROMAR 200 Interior Latex Semi-Gloss
3rd Coat - PROMAR 200 Interior Latex Semi-Gloss

Apply filler coat at a rate to ensure complete coverage with pores filled. Not less than 3.5 mils dry film thickness, excluding first coat.

Exposed Metal:

IPS2: 1st Coat – PROMAR Interior Latex Primer
2nd Coat – PROMAR 200 Interior Latex Semi-Gloss
3rd Coat – PROMAR 200 Interior Latex Semi-Gloss

Gypsum Drywall Systems – (General Use):

1st Coat - Interior Latex Based Primer Coat (FS TT-P-650).
2nd Coat & 3rd Coat – Odorless interior semi-gloss latex enamel (TS TT-E-509
Not less than 2.5 mils dry film thickness.

Painted Wood Work and Hardboard:

IPS-6: 1st Coat - Enamel Undercoat.
2nd Coat- Semi-gloss enamel.
3rd Coat - Semi-gloss enamel

Stained Woodwork:

IPS-5: 1st Coat - Exterior oil stain.
2nd Coat - Bleached Shellac.

3rd Coat - Rubbing Varnish.
4th Coat - Rubbing Varnish.

Surface Preparation: Wood must be dry and cleaned of dirt, grease, wax, polish, and marks. Old finishes in poor condition should be completely removed and the surface treated as a new surface (this shall apply to existing floors only). Sand wood to a smooth surface using 100-120 grit paper. If wood is stained, sand carefully to avoid sanding through the color. Remove sanding dust with a vacuum, no dust cloths shall be permitted. New wood should be stored inside for a minimum of 24 hours prior to staining. Stain or varnish applied to wood that has not been dried can exhibit blotching, discoloration, or cracking.

PART 3 EXECUTION

INSPECTION:

Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been correct in a manner acceptable to Applicator.

Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

SURFACE PREPARATION:

General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.

Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze as required. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer’s printed directions.

Clean concrete floor surfaces scheduled to be painted with a commercial solution or muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and allow to dry before painting.

Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill

holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.

Prime, stain, or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling. When transparent finish is required, use spar varnish for back-priming.

Back-prime paneling on interior partitions only where masonry or other wet wall construction occurs on backside.

Seal tops, bottoms, and cut outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch up shop applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch up with same type shop primer.

Galvanized Surfaces: Clean free of oil and surface contaminants with non petroleum based solvent.

MATERIALS PREPARATION:

Mix and prepare painting materials in accordance with manufacturer's directions.

Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue. Store materials not in actual use in tightly covered containers.

Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

APPLICATION:
General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated. Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop primed and touch up painted,

unless otherwise indicated.

Scheduling Painting: Apply first coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firms, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn through or other defects due to insufficient sealing.

Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

Transparent (Clear) Finish: Use multiple coats to produce glass smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.

Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

FIELD QUALITY CONTROL:

The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:

Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.

Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously

painted surfaces if, upon repainting with specified paint, the two coatings are non compatible.

CLEAN UP AND PROTECTION:

Clean Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using car not to scratch or otherwise damage finished surfaces.

Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

At completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

END OF SECTION 099000

SECTION 102100 – TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid plastic toilet compartments including the following: (Hiny Hiders)
   1. Floor mounted overhead-braced toilet compartments.
   2. Privacy screens.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. ASTM A 666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

E. Sustainable Design Submittals:
   1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.
   2. Regional Materials: Certify distance between manufacturer and Project and between manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. Labor not included in warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email:request info (info@scrantonproducts.com); Web:www.scrantonproducts.com
   1. Fabricator: Santana Toilet Partitions.
   2. Fabricator: Comtec Toilet Partitions.
   3. Fabricator: Capitol Toilet Partitions.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIAL

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.
   1. Recycled Content; Post Industrial: 25 percent.
   2. Recycled Content; Post Industrial: 100 percent.
   3. Recycled Content; Post Consumer: 100 percent.

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. Stainless Steel Castings: ASTM A167, Type 304.

D. Aluminum: ASTM 6463-T5 alloy.

2.3 SOLID PLASTIC TOILET COMPARTMENTS

A. Basis of Design: Hiny Hiders Toilet Partitions as manufactured by and supplied by Scranton Products.
   1. Style: Floor mounted overhead-braced toilet compartments.

B. Doors, Panels, and Pilasters: 1 inch (25 mm) thick with all edges rounded to a radius.

Mount doors and dividing panels based on height of specified system.

1. Door and Panel Height: 66 inches (1676 mm).
2. Aluminum heat sink fastened to bottom edges.
3. Panel Edge: Shiplap.
4. Pilasters: 82 inches (2083 mm) high and fastened to floor.

C. Panel Color: Hunter Green and provide full range of Colors (Traditional, Warm Tone, Bold and Metallic)

D. Panel Texture: Orange Peel From All Manufacturers Available Textures (Orange Peel, EX, Hammered and Rotary Brushed)

E. Pilaster Shoes: 3 inches (76 mm) high type 304, 20 gauge stainless steel. Secured to pilasters with a stainless steel tamper resistant Torx head sex bolt.

F. Headrail: Heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design. Finish to be clear anodized. Fastened to headrail brackets with stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.

1. Headrail Brackets: 20 gauge stainless steel with satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.

G. Wall Brackets:

1. Stainless Steel Brackets: Stainless steel type 304.
2. Brackets are fastened to pilasters with stainless steel tamper resistant Torx head screws and fastened to the panels with stainless steel tamper resistant Torx head sex bolts.
3. Bracket Type: Stirrup stainless steel double ear.

H. Door Hardware:

1. Continuous Stainless Steel Helix Hinge:
   a. Length: 54 inches (1372 mm).
2. Stainless Steel Slide Bolt Latch and Housing: Heavy-duty stainless steel type 304. The latch and housing to have a bright finish. The slide bolt and button to have a black anodized finish.
3. Doors supplied with one coat hook/bumper and door pull made of chrome plated Zamak.
4. Equip outswing handicapped doors with second door pull and door stop.

2.4 SOLID PLASTIC PRIVACY SCREENS

A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.

B. Panels, and pilasters, if required, 1 inch (25 mm) thick with edges rounded to a radius. Screens to be mounted at 14 inches (356 mm) above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.

1. Aluminum heat sink fastened to bottom edges.

C. Screen Type: Wall mounted.

1. Urinal Screens: Headrail braced. 24 inches (610 mm) wide by 42 inches (1067 mm) high.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings.

C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch (9.5 mm).

D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

E. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 104400 SPECIALTY SIGNS

PART 1 GENERAL

RELATED DOCUMENTS:
Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

DESCRIPTION OF WORK:
Extent of specialty signs is shown on drawings.

Forms of specialty signs required include the following:
- Interior Panel signs
- Project Job Sign

QUALITY ASSURANCE:
Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

SUBMITTALS:
Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.

Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacture and design of each sign component, including graphics.

Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations, and large-scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 PRODUCTS

ACCEPTABLE MANUFACTURERS:
Panel Signage
Manufacturers of Rooms Signs :
- Corpus Christi Stamp Works
- Bayuk Graphic Systems, Inc.
- MULTI-graphics, Inc.

MATERIALS:
Plastic Laminate: Provide high pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standard.

FABRICATION OF PANEL SIGNS::
Fabricate panels signs to comply with the requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction. Provide and install, one per door.

Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed condition within a tolerance of plus or minus 1/16" measured diagonally from

corner to corner.

Panel Signs: Fabricate unframed panel signs with edges mechanically and smoothly finished to conform to following requirements:

A. Character Proportion. Letters and numbers on signs should have a width to height ratio between 3:5 and 1:1 and a stroke width to height ratio between 1:5 to 1:10 utilizing an uppercase "X" for measurement.

B. Color Contrast. Characters and symbols shall contrast with their background.

C. Tactile Characters and Symbols. Characters, symbols, or pictographs on signs required to be tactile, shall be raised 1/32 inch minimum. Letters and numbers refer to plans for text height at specific locations. Font: Helvetica 721.

D. Interior Signs:
   A. Provide a sign at each door to each room of the building.
   B. Include braille message as required by ADA.
   C. Size: 7”x3”

E. Exterior Signs:
   A. Provide weather rated exterior sign at each of the following doors on the exterior of the building:
      1. Automotive Area
      2. Storage

   B. Include braille message as required by ADA.
   C. Size: 7”x3”

F. Restroom Signs:
   A. Provide a sign at each restroom door.
   B. Include braille message as required by ADA.
   C. Size: 6” x 8” (Pictogram should be 6”x6”. Restroom type should be in 2”x6” space)

G. Color: Provide full range of available colors.

PROJECT JOB SIGN:
Provide for (1) – 4’x8’ Plywood Sheets with Owner directed signage to be used on Project Job Sign. Provide for possible project renderings and school logos and images. Mount on 4”x4” post or as required to stand for duration of project. Location on site to be provided by Owner.

FINISHES:
Colors and Surface Textures: For exposed sign materials which require selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not otherwise indicated,
as selected by the Architect from the manufacturer's standards.

Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations.

Aluminum Finishes:
Baked Enamel Finish: Provide finish AA M4xC12C42Rlx (manufacturer's standard non

directional mechanical finish including sanding and filing; cleaning with inhibited chemicals; conversion coated with an acid chromate fluoride phosphate treatment; and painted with organic coating specified below).

Bronze Finishes:
Natural Satin Finish: NAAMM-M31-06x (fine satin directional textured mechanical finish with clear organic coating specified below).

Clear Organic Coating: Manufacturer's standard clear coating.

PART 3 EXECUTION:
INSTALLATION:
General: Locate sign units and accessories where shown or scheduled, using mounting methods of type described and in compliance with the manufacturer's instructions, unless otherwise indicated.

Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects of appearance.

Panel Signs:
Wall Mounted Units: Attach panel signs to wall surfaces using the methods indicated below:
Interior:
Vinyl Tape Mounting (VTM): Use double sided foam tape, or thickness indicated, to mount signs to smooth non porous surfaces. Do not use for vinyl covered or rough surfaces.

Where mounted on glass provide additional blank sign on inside of glass to conceal mounting tape.

Exterior:
Mechanically fasten securely to substrate. Fastener should be appropriate for substrate.

CLEANING AND PROTECTION:
At completion of the installation, clean soiled sign surface in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10440

SECTION 105100 PLASTIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Solid plastic lockers.
- B. Hardware and accessories.

1.02 REFERENCES
- A. ADA Accessibility Guidelines for Buildings and Facilities.

1.03 SUBMITTALS
- A. Provide submittals in accordance with Conditions of the Contract and Section 01330-Submittal Procedures.
- B. Submit shop drawings showing locker plan layout, numbering plan, profiles, and product components, including anchorage, accessories and finish colors.
- C. Submit product data on locker construction, hardware, and accessories.
- D. Submit two samples 4 x 4 inch (100 x 100 mm) in size illustrating finish and color.
- E. Submit maintenance data for installed products in accordance with Section 01780-Closeout Submittals.

1.04 DELIVERY, STORAGE AND HANDLING
- A. Generally comply with provisions of Section 01600-Product Requirements.
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store lockers indoors, protected from weather conditions and construction activities.

1.06 PROJECT CONDITIONS
- A. Building enclosed, completely protected from outside weather with minimum inside temperature of 60°F.

1.07 WARRANTY
- A. Provide manufacturer's twenty year warranty against rust, delamination or breakage of plastic components.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. The Mills Company, a subsidiary of Bradley Corporation, P.O. Box 309, Menomonee Falls, WI 53052-0309. Phone 800-BRADLEY (800-272-3539), FAX 262-251-5817. http://www.bradleycorp.com
- B. Scranton Products, 801 E Corey Street Scranton PA (800-445-5148). www.scrantonproducts.com
- C. Columbia PolyLife Lockers, 825 Garland Street, Columbia SC 29201 (800-252-3020).
- D. Substitutions: Comply with Substitution Requirements. Not Permitted after bid is awarded.

2.02 MANUFACTURED UNITS

A. Model Tufftec Lockers, 72-inch-high x 12 inch wide, 12” deep, Double Tier. (Boys Personal Storage A105 and Girls Personal Storage A107)

2.03 COMPONENTS

A. Tufftec Double Tier Lockers

1. Locker material: Sides, backs, shelves, tops, bottoms, doors, door frames and continuous latch constructed from high-density polyethylene (HDPE).
    a. Sides, shelves, tops, bottoms and backs fabricated from 3/8 inch (10 mm) HDPE.
    b. Doors, door frames and continuous latch fabricated from ½ inch (13 mm) HDPE.
    c. Slope tops fabricated from a single sheet of 3/8 inch (10 mm) HDPE.
    d. Bases fabricated from 1/2 inch (13 mm) HDPE.
    e. End panels and flat top fabricated from ½ inch (13 mm) HDPE.

2. Door hinge: Continuous piano hinge fabricated from 16 gauge type 304 stainless steel.

2.04 HARDWARE AND ACCESSORIES

1. Provide double-prong coat hook for each opening in one, two tier and z lockers.
2. Provide one number plate for each opening.
3. Provide screws, anchors and angle brackets for locker base installation.

2.05 FABRICATION

A. Tufftec Double Tier Lockers

1. Locker box fabricated from a single sheet of HDPE with corners fused together. Weld frame and shelves to box assembly.
2. Attach hinge to door and frame with vandal-resistant double threaded stainless steel screws.
3. Continuous latch securely attached to the entire length of the door with stainless steel screws, providing a full length latching mechanism capable of accepting several lock types.
4. Fabricate slope top from a single sheet of HDPE, grooved to permit bending to form a backing strip for attachment to wall.
5. Locking device: Pad lock
6. Base: 4” inch high.
7. End panels: Slope top locker configuration.
8. Factory finish:
    a. Tops, bottoms, side walls, backs and shelves, smooth black commercial grade.
    b. Door, door frames and continuous latch, slightly textured matte finish, color selected - Black.
    c. Hinge powder coated to match door and frame.
    d. Base color: Black.
    e. End panel - Black.
    f. Locker Color: Black

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that locker area is ready for installation.
B. Verify field measurements are as shown on approved shop drawings.
C. Verify that bases are properly, leveled, sized and in correct location.
D. Verify correct location of built-in framing and blocking.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installation of lockers and bases. Install plumb and square.
B. Anchor locker units to wall through the locker back with suitable anchor devices for the substrate.
C. Anchor locker units to floor [base for island applications] with hardware furnished by manufacturer.
D. Through-bolt adjoining locker units together to provide rigid installation.
E. Install accessories, number plates, end panels and sloped tops.

3.03 ADJUSTING

A. Section 01700 – Execution Requirements: Testing, adjusting, and balancing.
B. Adjust and align components to operate smoothly.
C. Correct minor damage to installed products; remove and replace work that cannot be satisfactorily repaired.

3.04 CLEANING

A. Section 01700 – Execution Requirements: Final cleaning.
B. Clean locker interiors and exterior surfaces.
C. Remove packaging and construction debris, and legally dispose of off-site.

END OF SECTION 105100

SECTION 105200 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:
Definition: "Fire extinguishers" as used in this section refers to units which can be hand carried, unless otherwise specified.

Types of products required include:
Fire extinguishers.
Fire extinguisher cabinets.

QUALITY ASSURANCE:
Provide portable fire extinguishers, cabinets and accessories by one manufacturer, unless otherwise acceptable to Architect.

SUBMITTALS:
Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. Where color selections by Architect are required include color charts showing full range of manufacturer's standard colors and designs available.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:
J. L. Industries.
Larsen's Mfg. Co.

FIRE EXTINGUISHERS:
General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authority.

Fill and service extinguishers to comply with requirements of governing authorities and manufacturer's requirement.

Multi Purpose Dry Chemical Type: UL rated 4 A: 60 BC, 10 lb. nominal capacity, in enameled steel container for Class A, Class B and Class C fires.

FIRE EXTINGUISHER CABINETS:
General: Provide fire extinguisher cabinets (FECB) where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

Cabinet Type: Suitable for mounting conditions indicated, of the following types:

Semi Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.
Exposed Trim: One piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
Rolled Edge Trim: Rounded edges with backbend depth as follows:
Depth: 2 1/2".
Trim Metal: of same metal as door.

Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

Door Style: Equal to JL Vertical Duo

Duo Panel: Tempered glass, 1/8" thick, unless otherwise indicated.

Additional Features: Red Vertical FE letters

Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous type hinge permitting door to open 180 degrees.
FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS
General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

Aluminum Finishes:
Provide #180 clear anodized door and frame.

PART 3 - EXECUTION

INSTALLATION:
Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

Where exact location of bracket mounted fire extinguishers is not indicated, locate as directed by Architect.

IDENTIFICATION:
Identify existence of fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk screen process. Provide lettering on door as indicated, or if not indicated, as selected by Architect from Manufacturer's standard letter sizes, styles, colors and layouts.

END OF SECTION 105200

SECTION 108000 TOILET ACCESSORIES

PART 1 GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of each type of toilet accessory is indicated on drawings and schedules.

Types of toilet accessories required include the following:

Mirrors
Grab bars
Paper Towel Dispenser
Double Toilet Tissue Dispenser
Liquid Soap Dispenser
Sanitary napkin disposal units

QUALITY ASSURANCE:
Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

SUBMITTALS:
Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

PART 2 PRODUCTS:

ACCEPTABLE MANUFACTURERS:
Bobrick Washroom Equipment, Inc.
Kimberly Clark
Newell Rubbermaid
Bradley Corporation
Georgia Pacific

MATERIALS, GENERAL:
Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.

Mirror Glass: FS DD G 451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating,

copper protective coating, and non metallic paint coating complying with FS DD M 411.
Galvanized Steel Mounting Devices: ASTM A 386, hot dip galvanized after fabrication.

Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

FABRICATION:
General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

Surface Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless-steel piano hinge. Provide concealed anchorage wherever possible.

- **Handicap Mirror**: Equal to Bobrick model no. B-165 - 2436, Framed Mirror. Provide one unit at each lavatory. (See plan for locations).
- **Paper Towel Dispenser (Manual)** Kimberly Clark model #K34348 (Quantity:3, Contractor to coordinate with Owner for locations). Paper towels #K25702
- **Grab Bar**: Equal to Bobrick model no. B-6806 series x 42" long, provide at each handicap water closet location.
- **Grab Bar**; Equal to Bobrick model no. B-6806 series x 36" long**,** provide at each handicap water closet location.
- **Double Toilet Tissue Dispenser:** Kimberly Clark model #K39731, provide at each stall. Toilet paper #K7006
- **Liquid Soap Dispenser:** Newell Rubbermaid Lumecel Autofoam dispenser White/grey pearl #1980828. Soap #AFSM. (See plan for locations).
- **Recessed Sanitary Napkin Disposal**: Equal to Bobrick model no. B-35303 (See plan for location).
- **Partition Mounted Napkin Dispenser**: Equal to Bobrick model no. B-354 (see plan for location.

PART 3 - EXECUTION

INSTALLATION:
Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated. General Contractor to provide for solid 2x wood blocking at toilet accessories mounted at gypsum drywall partitons.

ADJUSTING AND CLEANING:
Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION 108000

SECTION 13120 – PRE-ENGINEERED METAL BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel framing
2. Associated building components (metal panels, thermal insulation, trims, flashings, gutters, downspouts, accessories, etc.) as specified by Architect, to be incorporated by building manufacturer.
3. Field measurements of existing pre-engineered metal building columns, rafters, purlins and girts delegated to the contractor and pre-engineered metal building designer.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Foundations and anchor bolts.

B. Section 05120 - Structural Steel Framing

1.3 REFERENCES

A. ASTM A 36 - Standard Specification for Carbon Structural Steel.

B. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 ksi Tensile Strength.

C. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

D. ASTM A 572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steel.

E. ASTM A 653 - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

G. AWS D1.1 - Structural Welding Code; American Welding Society.

H. UL 580 - Tests for Wind Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.

1.4 DEFINITIONS

A. Building Width: Measured from outside to outside of metal studs.

B. Building Length: Measured from outside to outside of metal studs.

C. Building Line: Outside face of metal studs.

D. Building Eave Height: Measured from the top of the eave member at the outside of the exterior metal stud line to the bottom of the sidewall column base plate.

E. Bay Spacing: Measured from centerline to centerline of primary frame.

F. Roof Pitch: The ratio of the vertical rise to the horizontal run.

G. Existing structural members: The existing fabricated steel columns, girders, connections, cold formed metal purlins and girts.

1.5 DESIGN REQUIREMENTS

A. Design structural systems according to professionally recognized methods and standards using the 2012 International Building Code, AISC Manual of Steel Construction, and AISI Cold Formed Steel Design Manual.

B. The contractor and metal building designer shall field verify existing structural member sizes and load carrying capacity to confirm the existing building's capacity to carry proposed addition loads.

C. Design sealed by a Professional Engineer licensed in State of Texas.

D. Structural Performance: Metal building systems shall withstand the effects of the following loads within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads:
   a. Dead Loads: Self-weight, including weight of all indicated permanent construction.
   b. Roof Live Load: 20 psf (Reducible)
   c. Roof Collateral Load: 10 psf.
   d. Wind Load: Wind design based on the greater of:
      1) ASCE 7-16 requirements:
         a) Ultimate Design Wind Speed: 135 mph (Vasd = 105 mph)
         b) Risk Category: II
         c) Wind Exposure Category: C
         d) Internal Pressure Coefficient (GCpi): +/-0.18
         e) Kzt: 1.0
         f) Kd: 0.85
   e. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE 7-16.

2. Deflection and Drift Limits: No greater than the following:
   a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
   b. Design wall panel system to withstand specified loads with deflection of L/180 of span, maximum.
   c. Lateral Drift For Rigid Frames: Maximum of H/300 of the building height.
   d. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

3. Spandrel Beam: Reactions from the required loads shall be incorporated into the design of the primary rigid frames.

E. Structural Performance for Metal Panels:

1. Provide metal panel systems and attachments capable of withstanding component & cladding design wind pressures listed on drawings, based on testing according to ASTM E 1592.
2. Provide metal roof panel assemblies that comply with UL 580, Class 90.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F.

G. Anchor Bolts: Provide anchor bolt material, quantity and diameter. Embedment length of anchor bolt shall be by project structural engineer.

H. Manufacturer must be certified by AISC in the Metal Building category.

I. Supplier must be a primary manufacturer of frames, secondary steel, roof and wall sheeting, and trim.

1.6 SUBMITTALS

A. Provide electronic (PDF) copies of all required submittal information.

B. Delegated-Design Data: For metal building systems.

1. Provide detailed design criteria, analysis data and calculations indicating compliance with performance requirements, sealed by the Professional Engineer responsible for their preparation.
2. Include structural reactions at the base of frame columns.

C. Shop Drawings: Include full building plan, elevations, sections and details. Show primary and secondary framing member sizes and locations, cross-sections and connection details, including attachments to other work. Indicate components by others.

D. Anchor Bolt Installation Drawings: Plan layouts with minimum bolt diameters.

E. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

F. Third party independent laboratory reports of metal panel assembly meeting ASTM E1592 for the prescribed wind loads noted on the drawings.

G. Product Data: For each type of metal building system component. Include information on manufactured products to be incorporated into the work.

H. Welding certificates.

I. Material test reports.

J. Source quality-control reports.

K. Field quality-control reports.

L. Maintenance data.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a Professional Engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.8 WARRANTY

A. Reference Architectural

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Select materials and material yield strengths based on building design requirements; use the following unless required otherwise.

1. Structural Steel Plate, Bar, Sheet, and Strip for Use in Bolted and Welded Constructions: ASTM A 572, A570, A 529 or A 36 Modified 50, with minimum yield strength of 50,000 psi.
2. Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A 570 or A 607, with minimum yield strength of 55,000 psi (380 MPa).
3. Galvanized Steel Sheet for Roll Formed or Press Broken Roof and Wall Coverings, Trim and Flashing: ASTM A 653/A 653M, with minimum yield strength of 50,000 psi (345 MPa).
4. Galvalume Steel Sheet Used in Roll Formed or Press Broken Roof Covering: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, with minimum yield strength of 50,000 psi;

nominal coating weight of 0.5 oz per sq ft (equivalent to an approximate coating thickness of 0.0018 inch) both sides.

5. Hot Rolled Steel Shapes: W, M and S shapes, angles, rods, channels and other shapes; ASTM A 572 or ASTM A 36 as applicable; with minimum yield strengths required for the design.
6. Structural Bolts and Nuts Used with Primary Framing: High strength, ASTM A 325.
7. Bolts and Nuts Used with Secondary Framing Members: ASTM A 307.

E. All materials noted as “HD Galv.” shall be hot-dipped galvanized after fabrication.

2.2 FRAMING COMPONENTS

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse frames; rafters and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated on drawings.
2. Rigid Frames: Provide solid web framing consisting of tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns, as indicated on drawings. Provide a clear span that supports the loads at bay spacings indicated on drawings.

B. Secondary Framing: Manufacturer's standard secondary framing, including purlins, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating.

C. Purlins: Zee-shaped; depth as required; with minimum yield strength of 57,000 psi; simple span or continuous span as required for design.

D. Eave Strut: Cee shaped; depth as required; with minimum yield strength of 57,000 psi; simple span or continuous span as required for design.

E. Spandrel Beam: Wide flange; depth as noted in structural drawings; with minimum yield strength of 50,000 psi; simple span between rigid frame columns.

F. Wind Bracing: Portal, torsional, diagonal bracing or diaphragm in accordance with manufacturer's standard design practices; utilizing rods, angles, and other members, with minimum yield strengths as required for design.

G. Primary Frame Flange Bracing: Attached from purlins to the primary framing, minimum yield strength as required for design.

H. Sag Straps: Galvanized 2” wide steel strap, with minimum 50,000 psi yield strength.

I. Base Angles: 2 inch x 3 inch x 0.059 inch steel angles, with minimum yield strength of 55,000 psi, anchored to the floor slab or grade beam with power driven fasteners or equivalent at a maximum spacing of 4 feet on center and not more than 6 inches from the end of any angle member.

J. Anchor Bolts: Threaded anchor rods as indicated in Anchor Bolt Plan for attachment of metal building to foundation.

K. Fabrication: Fabricate according to manufacturer's standard practice.

1. Fabricate structural members made of welded plate sections by jointing the flanges and webs by continuous automatic submerged arc welding process.
2. Welding operators and processes: Qualified in accordance with AWS D1.1.

3. Field connections; Prepare members for bolted field connection by making punched, drilled, or reamed holes in the shop.

L. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.

M. All materials noted as “HD Galv.” shall be hot-dipped galvanized after fabrication.

2.3 METAL ROOF/WALL PANELS & THERMAL INSULATION

A. Reference Architectural

2.4 GUTTERS & DOWNSPOUTS, FLASHINGS, TRIMS & ACCESSORIES

A. Reference Architectural

2.5 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that foundations are installed correctly. Contractor shall notify Engineer of any deficiencies or discrepancies with the contract documents before proceeding.

B. Verify that anchor bolts are installed as indicated on anchor bolt shop drawings. Contractor shall notify Engineer of any deficiencies or discrepancies with the contract documents before proceeding.

3.2 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions, approved erection drawings and other erection documents.

B. Provide temporary bracing, shoring, blocking, bridging and securing of components as required during the erection process.

C. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's Professional Engineer.

D. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

E. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. 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.
3. 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.

F. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

G. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
   a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

H. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 13120

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 Mercedes Vocational Building Renovations", 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.
   c. Seal unused openings in floors, roofs and walls, as indicated in the drawings.

2. New Work:
   a. With Architect coordinate saw cutting of floors as noted on drawings and as needed.
   b. Plumbing fixtures and appliances such as water closets, lavatories, faucets, drinking fountains, instantaneous and storage type electric domestic water heaters, floor drains, specialized plumbing fixtures, valves, fittings, hardware and specialties.
   c. Potable water distribution piping and service connections to site utilities.
   d. Sanitary waste water and vent piping and service line connections to site utilities.
   e. Compressed air system and piping as shown on plans. Coordinate with existing compressed air infrastructure.
   f. Painting: See Division 9 specifications. Paint all exposed piping, insulation, hangers, accessories in interior exposed areas. Paint exterior pipe supports. Coordinate paint type, color and scope of work with Architect.

1.3 ALLOWANCES

A. See Division 0 Specifications.

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 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING 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.

1. Sleeves are not required for core-drilled holes.

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.
   a. 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.
   a. 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 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING 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 insulated 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.

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 220518

SECTION 220519 – METERS AND GAUGES FOR PLUMBING 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.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For each type of meter and gauge, from manufacturer.

C. Operation and Maintenance Data: For meters and gauges 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:
      a. Trerice, H. O. Co.
      b. Weiss Instruments, Inc.
      c. Winters Instruments - U.S.

   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 THERMOWELLS

A. 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.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 TEST PLUGS

A. Manufacturers

1. Flow Design, Inc.
2. Trerice, H. O. Co.
3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
4. Weiss Instruments, Inc.

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 ¼or 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.

2.4 TEST-PLUG KITS

A. Manufacturers:

1. Flow Design, Inc.
2. Trerice, H. O. Co.
3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

4. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gauge and adapter, and carrying case. Thermometer sensing elements, pressure gauge, 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. Pressure Gauge: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 200 psig.

E. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install test plugs in piping tees.

G. Install thermometers in the following locations:
1. Inlets and outlets of each domestic water heater.

3.2 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow service and maintenance of meters, gauges, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gauges to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with EPDM self-sealing rubber inserts.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Hot-Water Piping: 0 to 200 deg F.

END OF SECTION 22 05 19

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING 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 ball valves.
   2. Bronze gate valves.
   3. Bronze globe valves.

B. Related Sections:

   1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
   2. Division 22 Section "Identification for Plumbing 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. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

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 B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

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 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.

4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.

E. Valves in Insulated Piping: With 2-inchstem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:
1. Solder Joint: With sockets according to ASME B16.18.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers:
   a. NIBCO INC.
   b. Watts Industries, Inc.; Water Products Div.
   c. Kitz Corporation
   d. Apollo

2. Description:

   a. Standard: MSS SP-110.
   b. CWP Rating: 400 psig.
   c. Body Design: One piece.
   d. Body Material: Bronze.
   e. Ends: Threaded.
   f. Seats: PTFE or TFE.
   g. Stem: Bronze.
   h. Ball: Chrome-plated brass.
   i. Port: Reduced.

2.3 BRONZE GATE VALVES

A. Class 150, Bronze Gate Valves:

1. Manufacturers:
   a. NIBCO INC.
   b. Hammond Valve.
   c. Kitz Corporation.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   e. Apollo

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron**, bronze, or aluminum**.

2.4 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers:
a. Hammond Valve.
b. Milwaukee Valve Company.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
d. Kitz Corporation.
e. Apollo

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. 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.

E. 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.

3.3 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.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, or gate, or plug valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Globe or ball 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 2and 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 Copper Tubing, NPS 5and Larger: Flanged ends.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: One piece, regular port, bronze with bronze trim.
3. Bronze Gate Valves: Class 150.

4. Bronze Globe Valves: Class 150, bronze, nonmetallic disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves: Class 150.
3. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, stainless-steel disc.
4. Iron Gate Valves: Class 250.
5. Iron Globe Valves: Class 250.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING 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. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe stands.
6. 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 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

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 plumbing 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: Signed and sealed by a qualified professional engineer. 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. Fiberglass strut systems.
4. Pipe stands.
5. 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.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

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. Plastic Coating: PVC.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. 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 plastic 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-Mounting-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 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 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 powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. 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. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. 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.

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 Section 099113 "Exterior Painting." Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."

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 metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and 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. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
3. 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.
4. 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.
5. 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.
6. 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.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548.13 - VIBRATION CONTROLS FOR PLUMBING 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. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Elastomeric hangers.
5. Spring hangers.

B. Related Requirements:

1. Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment" for devices for fire-suppression equipment and systems.
2. Section 230548.13 "Vibration Controls for HVAC" for devices for HVAC 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.

C. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Welding certificates.

1.5 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, Waffle, non-slip pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Resilient and elastomeric.

C. Double-Deflection, Elastomeric Isolation Mounts:
1. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
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 in Two-Part Telescoping Housing:
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. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top housing with threaded mounting holes and internal leveling device, elastomeric pad.

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.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

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.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static within specified loading limits.

3.3 VIBRATION CONTROL DEVICE 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 Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 220548.13

SECTION 220553 - IDENTIFICATION FOR PLUMBING 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. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

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. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. 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.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. 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.

C. 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.

D. 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.

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 1/2 inch.

2.4 STENCILS

A. Stencils for Piping:

1. Lettering Size: Size letters according to ASME A13.1 for piping.
2. Stencil Paint: Exterior, gloss, alkyd enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 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 Section 099123 "Interior Painting." and Section 099600 "High-Performance Coatings."

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 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.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING 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 plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Domestic recirculating hot-water piping.
   4. Domestic chilled-water piping for drinking fountains.
   5. Storm water piping.
   6. Supplies and drains for handicap-accessible lavatories and sinks.

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, equipment connections, and access panels.
   6. Detail application of field-applied jackets.
   7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. 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.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

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 220529 "Hangers and Supports for Plumbing 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.

1.8 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.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. 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.

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 I for tubular materials.
   1. Products:
      a. Armaflex
      b. K-Flex

G. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products:
      a. Johns Manville; Micro-Lok.
      b. Knauf Insulation; 1000(Pipe Insulation.
      c. Owens Corning; Fiberglas Pipe Insulation.

   2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Products:
      a. Insulco, Division of MFS, Inc.; Triple I.
      b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Products:

a. Foster Products Corporation, H. B. Fuller Company
b. Aeroflex
c. Armacell
d. K-Flex

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. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
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 80 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."

D. ASJ Adhesive, and FSK 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).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products:
a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.

e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.5 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. Products:
a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. 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).
7. 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, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products:
a. Childers Products, Division of ITW; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. 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).
7. 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."

2.6 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.

2.7 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.

2.8 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..

2.9 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

   1. Products:
      a. Childers Products, Division of ITW; Metal Jacketing Systems.
      b. PABCO Metals Corporation; Surefit.
      c. RPR Products, Inc.; Insul-Mate.

   2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
      a. Sheet and roll stock ready for shop or field sizing.
      b. Finish and thickness are indicated in field-applied jacket schedules.
      c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper
      d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
      e. 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.

C. 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.

2.10 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products:
      a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
      b. Compac Corp.; 104 and 105.
      c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
      d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   4. Adhesion: 90 ounces force/inch in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. 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. Products:
      a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
      b. Compac Corp.; 110 and 111.
      c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
      d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
   2. Width: 3 inches.
   3. Thickness: 6.5 mils.
   4. Adhesion: 90 ounces force/inch in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.11 SECUREMENTS

A. Bands:
   1. Products:
      a. Childers Products; Bands.
      b. PABCO Metals Corporation; Bands.
      c. RPR Products, Inc.; Bands.

   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, 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: 0.080-inch nickel-copper alloy.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain subparagraph and list of manufacturers below. See Section 016000 "Product Requirements."

1. Manufacturers:
    a. C & F Wire.
    b. Childers Products.
    c. PABCO Metals Corporation.
    d. RPR Products, Inc.

2.12 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
    1. 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.

B. Protective Shielding Piping Enclosures:
    1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

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 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.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. 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 4 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. 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 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.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe 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 surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, 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 mineral-fiber blanket 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.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.8 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.

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
   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.

3.10 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 threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of

flanged 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.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Domestic hot-water storage tank insulation shall be the following, of thickness to provide an R-value of 13: Mineral-fiber pipe and tank.

3.12 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.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water Piping embedded in walls, and installed in unheated areas:
1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick, with two coats of protective coating recommended by the insulation manufacturer.

B. Domestic Hot and Recirculated Hot Water:
1. Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick, with two coats of protective coating recommended by the insulation manufacturer.

C. 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, with two coats of protective coating recommended by the insulation manufacturer.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

E. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Flexible Elastomeric: 1 inch thick.

F. Hot Service Drains:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.

G. Hot Service Vents:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.

H. Vapor barrier on all piping, except on hot water piping.

I. Insulation shall be painted where exposed to view. Coordinate with Architect.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Flexible Elastomeric: 1 inch thick.
      b. Vapor barrier.

3.15 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.

B. Piping, Exposed:
   1. Aluminum, Smooth: 0.020 inch thick.

3.16 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER 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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of water service.
2. Do not interrupt water 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.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

F. Copper Pressure-Seal-Joint Fittings:
1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

G. Copper Push-on-Joint Fittings:
1. Description:

a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

H. Copper-Tube, Extruded-Tee Connections:
1. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: tube.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.

D. Plastic-to-Metal Transition Unions:

1. Manufacturers:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company.

2. Description:

a. PVC four-part union.
b. Brass threaded end.
c. Solvent-cement-joint plastic end.
d. Rubber O-ring.
e. Union nut.

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:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Hart Industries International, Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1079.
3. Pressure Rating: 150 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 150 psig.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.

5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers:

a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Flex-Hose Co., Inc.
2. Flex Pression, Ltd.
3. Flex-Weld, Inc.
4. Hyspan Precision Products, Inc.
5. Metraflex, Inc.
6. Universal Metal Hose; a Hyspan company

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum **200 psig**
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. 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.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install PEX piping with loop at each change of direction of more than 90 degrees.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.

T. Install thermostats in hot-water circulation piping.

U. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

V. 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."

W. 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."

X. 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. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: 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.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. 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.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.10 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.11 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day 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 authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. 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 a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. 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 it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.12 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.

    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 CLEANING

A. Clean and disinfect domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, up to NPS 8 and larger, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

G. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

3.15 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER 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:

1. Backflow preventers.
2. Outlet boxes.
3. Wall hydrants.
4. Water-hammer arresters.
5. Trap-seal primer valves.
6. Trap-seal primer systems.
7. Flexible connectors.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 223200 "Domestic Water Filtration Equipment" for water filters in domestic water piping.
4. Section 224300 "Medical Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.
5. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
6. Section 224713 "Drinking Fountains" for water filters for water coolers.
7. Section 224716 "Pressure Water Coolers" for water filters for water coolers.
8. Section 224723 "Remote Water Coolers" for water filters for water coolers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G [**and NSF 14**].[**Mark "NSF-pw" on plastic piping components.**]

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: [**125 psig (860 kPa)**] unless otherwise indicated.

2.3 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

B. Manufacturers:
1. Zurn
2. Wilkins
3. Or Approved Equal.

C. Description:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: [**12 psig (83 kPa)]**
4. Size: see drawings.
5. Body: Bronze for NPS 2 (DN 50) and smalle
6. End Connections: Threaded for NPS 2 (DN 50) and smaller.
7. Configuration: Designed for [**horizontal, straight-through**] flow.
8. Accessories:

    a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.4 OUTLET BOXES

A. Icemaker Outlet Boxes:

1. Manufacturers:
   a. Guy Gray
   b. Zurn
   c. Moen

2. Description: See schedule.

2.5 WALL HYDRANTS

1. Manufacturers:
   a. Zurn
   b. Woodford
   c. Or Approved Equal

2. Description: See schedule.

2.6 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers:
   a. Zurn.
   b. Mifab.
   c. Wade.
   d. Or “Approved equal”.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: [Stainless Steel **Metal bellows**].
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.7 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers:
   a. PPP or Approved Equal
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig (860 kPa) minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.8 FLEXIBLE CONNECTORS

A. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum [**200 psig (1380 kPa)**].
2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

C. Install water-hammer arresters in water piping according to PDI-WH 201.

D. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
1. Reduced-pressure-principle backflow preventers.
2. Outlet boxes.

3. Supply-type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each [**reduced-pressure-principle backflow preventer**] [**double-check, backflow-prevention assembly**] [**and**] [**double-check, detector-assembly backflow preventer**] according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 221119

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 221319 - SANITARY WASTE 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:
   1. Cleanouts.
   2. Floor drains.
   3. Roof flashing assemblies.
   4. Through-penetration firestop assemblies.
   5. Miscellaneous sanitary drainage piping specialties.
   6. Flashing materials.
   7. Oil interceptors.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

   1. Oil interceptors.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

   1. Wiring Diagrams: Power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

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. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.7 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts: see detail on plans.
2. Standard: ASME A112.36.2M for [**cast-iron soil pipe with cast-iron ferrule**] [**threaded, adjustable housing**] cleanout.
3. Size: Same as connected branch.
4. Type: [**Threaded, adjustable housing**].
5. Body or Ferrule: [**Cast iron**].
6. Clamping Device: [**Required**].
7. Outlet Connection: [**Threaded**].
8. Closure: [**Cast-iron plug**].
9. Adjustable Housing Material: [**Cast iron**] with [**threads**].
10. Frame and Cover Material and Finish: [**Nickel-bronze, copper alloy**]
11. Frame and Cover Shape: [**Round**].
12. Top Loading Classification: [**Medium**] Duty.

B. Plastic Wall Cleanouts:

1. See detail on plans.
2. Size: Same as connected branch.
3. Body: PVC.

4. Closure Plug: Stainless Steel.
5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.2 FLOOR DRAINS

A. Manufacturers:

1. Zurn.
2. Mifab.
3. Josam.
4. Wade.
5. Watts.

B. Description: See schedules.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Description: Manufactured assembly made of [**6.0-lb/sq. ft. (30-kg/sq. m)**, **0.0938-inch-(2.4-mm-)**] thick, lead flashing collar and skirt extending at least [**6 inches (150 mm)**] from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

    a. Open-Top Vent Cap: Without cap.
    b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
    c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
5. Special Coating: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend [**1 inch (25 mm)**] [**2 inches (51 mm)**] <**Insert dimension**> above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 OIL INTERCEPTORS

A. Oil Interceptors:

1. Description: See Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Coordinate with Structural Drawings prior installation.
b. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
c. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
d. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Install through-penetration firestop assemblies in plastic [**conductors**] [**and**] [**stacks**] at floor penetrations.

H. Assemble open drain fittings and install with top of hub [**1 inch (25 mm)**] [**2 inches (51 mm)**] above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install oil interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

O. Install wood-blocking reinforcement for wall-mounting-type specialties.

P. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Oil interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled **[Oil Separator]** and its installation, including piping and electrical connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain **[Oil Separator]**. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 221319

SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR 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. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

B. Related Sections include the following:
1. Section 221519 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. CR: Chlorosulfonated polyethylene synthetic rubber.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. HDPE: High-density polyethylene plastic.

E. NBR: Acrylonitrile-butadiene rubber.

F. PE: Polyethylene plastic.

G. PVC: Polyvinyl chloride plastic.

H. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig.

I. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
1. Dielectric fittings.
2. Flexible pipe connectors.
3. Safety valves.
4. Pressure regulators. Include rated capacities and operating characteristics.
5. Automatic drain valves.

6. Filters. Include rated capacities and operating characteristics.
7. Lubricators. Include rated capacities and operating characteristics.
8. Quick couplings.
9. Hose assemblies.

1.5 INFORMATIONAL SUBMITTALS

A. Brazing and welding certificates.

B. Qualification Data: For Installers.

C. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:
1. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by T-DRILL Industries Inc., for making branch outlets.
2. Pressure-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
3. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by Victaulic Company.

B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. ASME Compliance:
1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L seamless, drawn-temper, water tube.
1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.

2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
3. Copper Unions: ASME B16.22 or MSS SP-123.
4. Press-Type Fittings, NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
5. Press-Type Fittings, NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
6. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube according to ASTM F 2014.
7. Grooved-End Fittings and Couplings:
   a. Grooved-End Fittings: ASTM B 75, copper tube or ASTM B 584, bronze castings.
   b. Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gasket for oil-free compressed air. Provide NBR gasket if compressed air contains oil or oil vapor.

B. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.3 VALVES

A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged according to CGA G-4.1 for oxygen service.

B. Zone-Valve Box Assemblies: Box with gas valves, tube extensions, and gages.

1. Zone-Valve Boxes:
   a. Steel Box with Stainless-Steel Cover:
   b. Manufacturers:
      1) Allied Healthcare Products, Inc.; Chemetron Div.
      2) Allied Healthcare Products, Inc.; Oxequip Health Industries.
      3) Amico Corporation.
      4) Beacon Medical Products.
      5) Hill-Rom.
      6) Squire-Cogswell/Aeros Instruments.
      7) Tri-Tech Medical, Inc.
   c. Description: Formed steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gages and in sizes required to permit manual operation of valves. Air and vacuum tubing, valves, and gages may be incorporated in zone valve boxes for gases.

      1) Interior Finish: Factory-applied white enamel.
      2) Cover Plate: stainless-steel with frangible or removable windows.

3) Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, according to NFPA 99.

C. Ball Valves:

1. Manufacturers:

a. Allied Healthcare Products, Inc.; Chemetron Div.
b. Allied Healthcare Products, Inc.; Oxequip Health Industries.
c. Beacon Medical Products.
d. EMSE Corporation.
e. Hill-Rom.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Squire-Cogswell/Aeros Instruments.

2. Standard: MSS SP-110.
3. Description: Three-piece body, brass or bronze.
4. Pressure Rating: 300 psig minimum.
5. Ball: Full-port, chrome-plated brass.
6. Seats: PTFE or TFE.
7. Handle: Lever type with locking device.
8. Stem: Blowout proof with PTFE or TFE seal.
9. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.

D. Check Valves:

1. Manufacturers: Same as for ball valves.
2. Description: In-line pattern, bronze.
3. Pressure Rating: 300 psig minimum.
4. Operation: Spring loaded.
5. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.

2.4 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. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 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. 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.

2.5 FLEXIBLE PIPE CONNECTORS

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:

B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.

2.6 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Line Pressure Regulators: Diaphragm operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.

C. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is indicated.

D. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded. Include mounting bracket if wall mounting is indicated.

E. Mechanical Filters: Two-stage, mechanical-separation-type, air-line filters. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock. Include mounting bracket if wall mounting is indicated.

F. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Include mounting bracket if wall mounting is indicated.
   1. Provide with automatic feed device for supplying oil to lubricator.

2.7 QUICK COUPLINGS

A. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

B. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.
   1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
   2. Plug End: Flow-sensor-bleeder, check-valve type with barbed outlet for attaching hose.

C. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.
   1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
   2. Plug End: With barbed outlet for attaching hose.

2.8 HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig minimum working pressure, unless otherwise indicated.
   1. Hose: Reinforced double-wire-braid, CR-covered hose for compressed-air service.
   2. Hose Clamps: Stainless-steel clamps or bands.
   3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
   4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Compressed-Air Piping: Use one of the following piping materials for each size range:
   1. Type K or L, copper tube; wrought-copper fittings; and brazed joints.
   2. Type K or L, copper tube; press-type fittings; and pressure-sealed joints.

B. Drain Piping: Use the following piping materials:

1. NPS 2 and Smaller: Type M copper tube; wrought-copper fittings; and brazed or soldered joints.

3.2 VALVE APPLICATIONS

A. Metal General-Duty Valves: Comply with requirements and use valve types specified according to the following:
   1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
   2. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
   3. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
   4. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, 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 otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:
   1. Use steel companion flange with gasket for connection to steel pipe.
   2. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Flanged joints may be used instead of specified joint for any piping or tubing system.

J. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F 2014.

K. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

L. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."

N. Install piping to permit valve servicing.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

R. 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."

S. 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."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.4 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. 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.

D. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F 2014, with tools recommended by procedure manufacturer, and using operators qualified according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

H. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

I. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators qualified according to Part 1 "Quality Assurance" Article.

J. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements Valves for Plumbing Piping.

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 and Smaller: Use dielectric unions.

C. NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.

B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.8 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters. Mount on wall at locations indicated.

F. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters. Mount on wall at locations indicated.

G. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.

H. Install quick couplings at piping terminals for hose connections.

I. Install hose assemblies at hose connections.

3.9 CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

C. Vertical Piping: MSS Type 8 or 42, clamps.

D. Individual, Straight, Horizontal Piping Runs:
   1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
   2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

E. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

F. Base of Vertical Piping: MSS Type 52, spring hangers.

G. Support horizontal piping within 12 inches of each fitting and coupling.

H. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1/4: 60 inches with 3/8-inch rod.
   2. NPS 3/8 and NPS 1/2: 72 inches with 3/8-inch rod.
   3. NPS 3/4: 84 inches with 3/8-inch rod.
   4. NPS 1: 96 inches with 3/8-inch rod.
   5. NPS 1-1/4: 108 inches with 3/8-inch rod.
   6. NPS 1-1/2: 10 feet with 3/8-inch rod.
   7. NPS 2: 11 feet with 3/8-inch rod.
   8. NPS 2-1/2: 13 feet with 1/2-inch rod.
   9. NPS 3: 14 feet with 1/2-inch rod.
   10. NPS 3-1/2: 15 feet with 1/2-inch rod.
   11. NPS 4: 16 feet with 1/2-inch rod.

J. Install supports for vertical copper tubing every 10 feet.

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.12 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:
   1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
   2. Repair leaks and retest until no leaks exist.
   3. Inspect filters lubricators and pressure regulators for proper operation.

C. Prepare test reports.

END OF SECTION 221513

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

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. Commercial, electric, storage, domestic-water heaters.
   2. Flow-control, electric, tankless, domestic-water heaters.
   3. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

   1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial and tankless, electric, domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

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. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Electric, Domestic-Water Booster Heaters:

1) Controls and Other Components: Five years.

b. Commercial, Electric, Storage, Domestic-Water Heaters:

1) Storage Tank: Ten years.
2) Controls and Other Components: Five years.

c. Electric, Tankless, Domestic-Water Heaters: Five year(s).
d. Compression Tanks: Ten years.

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Electric, Domestic-Water Heaters:

1. Commercial, Storage, Electric Water Heaters:
   a. Bradford White Co.
   b. State Industries.

2. Standard: UL 1453.
3. Tank Construction: ASME-code steel with 150-psig working-pressure rating..

   a. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, pressure gage, thermometer, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. ASME B1.20.1 pipe thread.
   b. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
   c. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
   d. Jacket: Steel, with enameled finish.

4. Factory-Installed Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   c. Insulation: Comply with ASHRAE/IESNA 90.1.
   d. Jacket: Steel with enameled finish.
   e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
   f. Temperature Control: Adjustable thermostat.
   g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
   h. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valve. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
   i. Gages: Combination temperature-and-pressure type or separate thermometer and pressure gage.

5. Special Requirements: NSF 5 construction.

6. Capacity and Characteristics: See Drawings

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers:

    a. Controlled Energy Corporation.
    b. Chronomite Laboratories, Inc.
    c. Eemax.
2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.

    a. Connections: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Heating Element: Resistance heating system.
    d. Temperature Control: Flow-control fitting.
    e. Safety Control: High-temperature-limit cutoff device or system.
    f. Jacket: Aluminum or steel with enameled finish or plastic.

4. Support: Bracket for wall mounting.
5. Capacity and Characteristics: See drawings.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. AMTROL Inc.
    b. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
    c. State Industries.
    d. Taco, Inc.
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics: See drawings.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.

1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.

G. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

H. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.

I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

J. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

K. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

L. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

D. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers.

I. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves and thermometers.

J. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig. Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."

K. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

L. Fill electric, domestic-water heaters with water.

M. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

C. Connect hot- and cold-water piping with shutoff valves and unions.

D. Make connections with dielectric fittings where piping is made of dissimilar metal.

E. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

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.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial and tankless, electric, domestic-water heaters.

END OF SECTION 223300

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
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 mechanical and controls systems for the project "STISD Mercedes Vocational Building Renovations", including but not limited to the following:

1. Demolition Work:
   a. Remove HVAC equipment and materials as indicated. The Owner has right of first refusal. Dispose of equipment and materials that Owner no longer wishes to retain.
   b. Demolish existing hardware, controls, ductwork, air-devices, and accessories as indicated and that will no longer be needed.
   c. Refer to Architectural drawings for work related to wall openings.

2. New Work: Provide all materials and labor associated with new fully-operational mechanical and controls systems, including but not limited to the following:
   a. Building exhaust fans and associated louvers.
   b. Ceiling fans and related controls.
   c. Ductwork, diffusers, grilles, dynamic fire dampers, control dampers, zone dampers and OA intake louvers, and other accessories.
   d. Provide specialty systems scheduled on drawings. These include, but are not limited to, vehicle exhaust system, carbon monoxide sensors, etc.
   e. Testing, Adjusting, & Balancing.
   f. Shop drawing submittals for all mechanical systems including but not limited to equipment, ductwork and piping.
   g. Coordination drawings for placing of mechanical systems in relation to work by other disciplines.
   h. Contractor is responsible for providing wind storm certification inspections and certifications for exterior mounted equipment. Contractor must notify Inspector prior to installing equipment, and apprise inspector of work scheduling involving equipment requiring wind inspection / certification, so that inspections may be

carried out at required stage(s) of construction. Cost for inspection shall be borne by the Contractor. Inspector shall be certified by the Texas Department of Insurance (see www.tdi.state.tx.us for a list of certified Inspectors).

i. Coordinate electrical work with Div. 26 as required.

j. Coordinate fire alarm related work with Fire Alarm Contractor. Provide smoke detectors, wiring and controls for units, 2000 cfm and larger, where none exist.

3. 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.

1.3 ALLOWANCES

A. Mechanical Allowance shall be administered per Division 1 specifications.

1.4 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 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. This includes and is not limited to all controls equipment, materials, sensors, relays, contactors, dampers, valves, power for panels, and labor. 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. 22 for Plumbing 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. 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 an inspection by TAB contractor prior to developing detailed TAB Plan.
   6. When ready to conduct complete Automation System software demonstration.
   7. When ready for Substantial Completion Inspection.
   8. When ready for Final Inspection.

O. 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.
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.

1.6 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 mechanical submittals at the same time in one or multiple bound volumes. Include originals from manufacturer or high-quality copies. 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.

1.8 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. TAB
5. Allowances.
6. Miscellaneous
7. 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. 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.

1.10 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 230010

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC 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 general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque. Unless otherwise noted, windings shall be:

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

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.

SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

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 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. Contractor shall coordinate activities and assist TAB Contractor as needed.

B. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

2. Testing, adjusting, and balancing existing systems and equipment.
3. Duct leakage tests.
4. 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 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. System Readiness Checklists: Within 7 days of Contractor's Notice, submit system readiness checklists as specified in "Preparation" Article.

C. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

D. Certified TAB reports.

E. Sample report forms.

F. 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.

1.5 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."

1.6 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with 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 operating safety interlocks and controls on HVAC equipment.

O. 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. 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.

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 each component that makes up the air-handling system.
    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.

3.6 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.

3.7 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.

3.8 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.

C. Measure and record indoor conditions served by each HVAC system. Make measurements at multiple locations served by the system if required to satisfy the following:
1. Most remote area.
2. One location per floor.
3. One location for every 5000 sq. ft..

D. Measure and record the following indoor conditions for each location two times at two-hour intervals, and in accordance with ASHRAE 113:
1. Temperature.
2. Relative humidity.
3. Air velocity.
4. Concentration of carbon dioxide (ppm).
5. Concentration of carbon monoxide (ppm).

3.9 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.10 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.

4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
10. Verify controls sequences for other MEP items as specified.

3.11 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.

3.12 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.

3.13 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. VFD settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

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. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.
6. Position of balancing devices.

E. 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.

F. 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.

G. 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.

H. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.

B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

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.

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: 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.

D. Service: Ten feet of exhaust air duct closest to where duct penetrates the exterior envelope.
1. Material: Exterior wrap.
2. Thickness: 2 inches.

E. Where ductwork is not completely concealed, paint all ductwork and insulation. Coordinate color and finish with Architect.

END OF SECTION 230713

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 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:

B. Vehicle Exhaust Ducts: See drawings for specifications for a hose-reel system and related accessories. Provide duct materials, and optional equipment per manufacturer’s recommendations.

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 233423 - HVAC POWER VENTILATORS

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. Ceiling-mounted ventilators.
   2. In-line fans.
   3. Propeller fans
   4. Ceiling fans

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Fan speed controllers.

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. Delegated-Design Submittal: For unit hangars and supports 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. 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.
   2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling 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. Framing and support members relative to duct penetrations.
   2. Ceiling suspension assembly members.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Framing and support members relative to duct penetrations.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 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. Belts: One set for each belt-driven unit.

1.8 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of equipment supports, and wall penetrations.

1.10 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and

shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by Contractor and signed by manufacturer, agreeing to replace components that fail in materials and workmanship within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
   1. Warranty Period: One (1) year parts and labor for fan and motor, including all components, from date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. HVAC Power Ventilators: Subject to compliance with requirements, provide products by one of the following:
   1. Loren Cook Company.
   2. Greenheck Fan Corp.
   3. New York Blower Company (The).
   4. Penn Ventilation.

B. Ceiling Fans: Subject to compliance with requirements, provide products by one of the following:
   1. Bigass Fans.
   2. Macro Air (contact Texas Air Products at 210.495.8100)

2.2 CEILING-MOUNTED VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal forward curved type, injection molded of polypropylene resin for smaller fans, galvanized steel for larger fans.

D. Grille: Manufacturer’s standard **Aluminum**, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Factory mounted disconnect
4. Stainless steel insect screen
5. Isolation: Rubber-in-shear vibration isolators.
6. Aluminum backdraft damper
7. Vibration isolator kit
8. Time-Delay Switch: See schedules for switch coordination.
9. See schedules for other options.

2.3 IN-LINE CENTRIFUGAL AND MIXED FLOW INLINE FANS

A. Description: In-line, centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:
1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
5. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit. **See schedules.**
6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
7. See schedules for other options.

2.4 IN-LINE CENTRIFUGAL FANS

A. Description: In-line mounted, centrifugal fans that are UL 705 listed, AMCA certified.

B. Housing: 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly mounted on 14 ga. reinforced channel, resiliently mounted fan. Inlet and outlet duct flanges, reinforced aluminum dampers with continuous aluminum hinge rods and brass bushings.

C. Wheels: twin DWDI centrifugal forward curved type, galvanized steel, balanced in accordance with AMCA Std 204-96 Balance Quality and Vibration Levels for Fans.

D. Motor: Totally enclosed with permanently lubricated bearing and built-in thermal overload protection.

E. Accessories:
1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired.
2. For two speed exhaust fans in science laboratories, do NOT include integral disconnect switch. This will be provided by electrical. See schedules.
3. See schedules for other options.

2.5 PROPELLER FANS

A. Description: Belt-driven or direct-driven propeller fans consisting of fan blades, hub, housing, orifice ring, motor, drive assembly, and accessories.

B. Housing: Galvanized steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Propeller: High-efficiency fabricated steel design with blades securely fastened to a minimum 7 gauge hub. The hub shall be keyed and locked to the fan shaft utilizing two setscrews. Propeller shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

D. Belt-Driven Drive Assembly: Resiliently mounted to housing, statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor: 1.5.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

a. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.

4. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
5. Motor Pulleys: Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
6. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
7. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

E. Accessories:

1. Insect Screen.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Single winding motor with motor starter.

5. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
6. Coating: Baked, polyester powder coating with paint to exceed 1000 hour salt spray under ASTM B117 test method.

2.6 CEILING FANS

A. Description:
1. Variable speed control fan with mounting hardware.
2. TUV certified, UL Standard 507.
3. Mounting system: Formed metal design using low-carbon steel, powder coated for corrosion resistance with stainless steel mounting bolts. Round, extruded aluminum tube fan extension with forward-reverse controls and fan status indicator lights visible from floor.
4. Hub: Zinc plated steel.
5. Safety cable (3/16" diameter, 7x19 stranded galvanized steel, pre-loaded and tested to 3200 lbf)) for additional means of securing fan assembly to building structure.
6. Wall controls: Low-voltage remote wall control, mounted in standard electrical box, rotary dial, LED lights showing faults. Communication with standard CAT 5 or higher Ethernet cable. Provide optional RF remote wall control with capacity touch display with wireless communication with fan drive and controller. Coordinate with Architect.

B. Airfoil system:
1. 8 high volume, low speed airfoils of precision extruded anodized aluminum alloy, connected to the hub and interlocked with stainless steel retainers, bolts and lock washers.
2. Equipped with 8 upswept airfoil tips designed to redirect outward airflow downward for efficiency. Winglets shall be high strength polymer attached with SS screws.

C. Motor:
1. Permanent magnet brushless motor, capable of modulating between 0-100% speed without gearbox.
2. Motor shall be non-ventilated, heat-sink design.

D. Controls:
1. Fan controller shall be incorporated into the fan assembly, factory programmed to minimize starting and breaking torques, equipped with simple diagnostics, LED lights to identify and relay faults in system.

E. Warranty:
1. 10 year warranty on motor, drive and controller.
2. Lifetime warranty on blades, hub, and mounting system.

F. Coordinate with supplier for installation details related to miscellaneous structural metal work and electrical wiring and controls.

G. Start up and training services by factory authorized personnel.

H. Refer to schedules and plans.

2.7 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.8 SPECIALIZED ACCESSORIES AND OPTIONS

A. For vehicular exhaust application, provide spark resistant fans and finishes per schedules.

B. Provide accessories and options per schedules.

2.9 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548.13 "Vibration Controls for HVAC."

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Adjust belt tension.
   6. Adjust damper linkages for proper damper operation.
   7. Verify lubrication for bearings and other moving parts.
   8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
   9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
   10. Shut unit down and reconnect automatic temperature-control operators.
   11. Remove and replace malfunctioning units and retest as specified above.

B. Starting Procedures:
   1. Energize motor and adjust fan to indicated rpm.
   2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.
   1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
   2. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

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 grilles, registers, diffusers, and other air devices

B. Related Sections:

1. Section 089116 "Operable Wall Louvers" and Section 089119 "Fixed Louvers" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the manufacturers specified:
   1. Price Industries.
   2. Titus.

2.2 AIR DEVICES

A. Rectangular and Square Ceiling Grilles, Registers, Diffusers: See schedules for material, finish, size, pattern, damper type, and accessories.

B. Fire rated air devices: Plans indicate a “fire damper” designation on diffusers that need a fire rated air device. Coordinate with plans.

2.3 INSULATION

A. All cold surfaces that are susceptible to condensation shall be insulated.

B. Insulation may be provided by manufacturer or by installing Contractor. Coordinate with installing Contractor.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design

requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

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 I.S.D. Mercedes Vocational Building Renovations" consists of an existing single-story building, approximate 19,146 s.f. This building is generally 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 a complete operational electrical distribution system. Major items of work include, but are not limited to:

(a) Electrical Service:

(i) Connect to existing Utility pad mounted transformer. Coordinate work with AEP school staff.

(ii) Engage with AEP staff right away to ensure smooth process of new disconnect installation

(b) Interior and Exterior Lighting systems: Provide LED type, see light fixture schedule and specifications.

(c) Lighting Controls (switches, vacancy sensors, etc.): Provide as noted on plans specifications. In some cases, they will be ceiling mounted and others wall mounted. It's the intent for them to be wired to automatically control the luminaires in their respective areas.

(d) Power Systems: Provide miscellaneous duplex receptacles, receptacles for automotive equipment, and hardwire connections for power to automotive, H.V.A.C. and plumbing equipment.

(e) Fire Alarm System: Expand/Modify/Upgrade existing addressable control panel. Provide manual, automatic initiation devices and indicating devices to comply with TDLR.

(f) School Intercom System: Expand/Modify/Upgrade existing. Provide/relocate speakers to transmit general announcements.

(g) Intrusion Detection System: Expand/Modify/Upgrade existing control panel. Provide motion detectors and magnetic contacts as noted on drawings.

(h) Voice and Data Communication Cabling Equipment: Provide rough-ins only. Cabling, connectors, patch panels, racks, etc. provided by Owner.

(i) Access Control and CCTV System: Provide rough ins only. Cameras, card readers, release buttons, software programming and equipment including power to secured doors and power supplies provided by Owner.

(j) 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 is 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 and plumbing equipment.

G. Fully coordinate with the Owner for the automotive equipment installation.

H. 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 to conduct complete Fire Alarm, and Intrusion Detection demonstration.
6. When ready for Substantial Completion Inspection.
7. When ready for Final Inspection.

I. 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. Plumbing, Mechanical & 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. 260544 Sleeves and Sleeve Seals for Electrical Raceways and Cabling
   f. 260553 Identification for Electrical Systems
   g. 262726 Wiring Devices

2. **Electrical Gear Submittal #2**
   a. 262416 Panelboards
   b. 262813 Fuses
   c. 262816 Enclosed Switches and Circuit Breakers
   d. 262913 Enclosed Controllers
   e. 264313 Surge Protection for Low-Voltage Electrical Power Circuit

3. **Light Fixtures Submittal #3**
   a. 260923 Light Control Devices
   b. 265116 Interior Lighting
   c. 265219 Emergency and Exit Lighting
   d. 265621 Exterior Lighting

4. **Special Systems: Submittal #4**
   a. 267210 Fire Alarm System
   b. 267230 School Intercom
   c. 267240 Intrusion Detection System

5. **Electrical Commissioning Submittal #5**

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. Light Fixtures.
4. Exterior Light Fixtures.
5. Wiring Devices.
6. Fire Alarm System.
7. School Intercom System.
8. Intrusion Detection System.
9. Commissioning
10. Allowances.
11. Miscellaneous.
12. 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.

D. Multiconductor Cable: Comply with UL 1569 and NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC and Type SO with ground wire.

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: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, 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.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless **exothermic**-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 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. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Metal-clad cable runs.
8. 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.

3.4 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.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.5 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.

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 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Sections "Cast-in-Place Concrete" or "Miscellaneous Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

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 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. Surface raceways.
5. Boxes, enclosures, and cabinets.
6. 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. Fittings for and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

E. 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 3R unless otherwise indicated, 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 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Wiring Device-Kellems
b. Thomas & Betts Corporation.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.
e. Panduit.

2.5 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. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.

K. Gangable boxes are allowed as along is permitted by the NEC.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for indoor applications and Type 3R (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.

M. Cabinets:

1. NEMA 250, Type 1 or Type 3R galvanized-steel 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.

2.6 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.

2.7 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 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
4. Damp or Wet Locations: GRC.
5. 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. Rigid Steel Conduits: Use only fittings listed for use with this type of conduit.
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. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. 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.

U. 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.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. 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.

X. 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.

Y. 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.

Z. 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.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. 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.

DD. 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 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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 for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Grout.
3. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.3 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 150 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. 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."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

END OF SECTION 260544

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 ARMORED AND METAL-CLAD 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 cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. 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.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

E. 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.

2.3 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.

2.4 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.

2.5 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."

2.6 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.

2.7 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.

2.8 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 6 to 8 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 with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. Fire Alarm System
4. Intrusion Detection System
5. 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 col-

ors 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. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

O. 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. Emergency system boxes and enclosures.
e. Disconnect switches.

f. Enclosed circuit breakers.
g. Motor starters.
h. Push-button stations.
i. Intercommunication and call system master and staff stations.
j. Fire-alarm control panel and annunciators.
k. Intrusion-detection control stations, control panels, and terminal cabinets.

3.3 INSTALLATION

Verify 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. Lighting and Lighting controls.
2. Electrical and Electrically 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 and lighting technicians.
    c. Lighting controls installers.

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. Lighting Systems:

1. Light Fixtures: Verify all lamps work without flicker.
2. Light Switches: Verify switches control lights per design
3. Lighting Controls: Verify Schedule and/or photocell controls

B. 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.

C. 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.

D. 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 260923 - LIGHTING CONTROL DEVICES

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.

B. All contract documents and addenda.

1.2 SUMMARY

A. Section includes all OD & OS sensors including multi-technology, ultrasonic, and passive infrared (PIR) technologies. This includes self-contained PIR sensors that are switch-mounted and ceiling-mounted, as well as a low voltage line, which works with a power pack and add-a-relay units.

- Self-contained wall switch with infrared: ODS10-ID, ODS0D-ID
- Self-contained Smart wall switch with infrared and LED night light: ODS15-ID, ODD10-ID, ODD24-ID, ODP10-I1
- Self-contained wall switch with multi-technology: OSSMT-MD, OSSMD-XX
- Self-contained Provolt™ line voltage infrared ceiling-mount: ODCXX-ID, O2CXX-ID, O3CXX-ID, O4CXX-ID
- Self-Contained Provolt™ line voltage ultrasonic ceiling-mount: ODCXX-UD, O2CXX-UD
- Self-Contained Provolt™ line voltage multi-technology ceiling-mount: ODCXX-MD, O2CXX-MD, O3CXX-MD, O4CXX-MD
- Self-Contained Provolt™ Room Controller (PRC) line voltage infrared ceiling-mount: O5C04-ID, O6C04-ID
- Self-Contained Provolt™ Room Controller (PRC) line voltage multi-technology ceiling-mount: O5C20-MD, O6C20-MD
- Self-contained infrared ceiling-mount: ODC0S-I1, ODC0S-I7
- Self-contained infrared external fixture mount: OSFHU-XX, OSFHW-XX, OSFHP-XX, OSFHS-XX, HB011-XX
- Self-Contained infrared in-fixture mount: OSF20-XX
- Self-Contained infrared in-fixture mount: OSF10-XX
- Low-voltage multi-technology ceiling-mount: OSC20-MXW, OSC10-MXW, OSC05-MXW, OSC20-RMW, OSC10-RMW
- Low-voltage ultrasonic ceiling-mount: OSC20-U, OSC10-U, OSC05-U
- Low-voltage infrared ceiling-mount: OSC15-I, OSC04-I
- Low-voltage multi-technology wall/corner wide view: OSW12-MXW, OSW12-RMW
- Low-voltage infrared wall/corner wide view: OSWWV-I
- Low-voltage infrared wall/corner high bay: OSWHB-I
- Low-voltage wall/corner long range: OSWLR-I

- Power pack for low voltage sensors: OSP20-0D0, OSP20-RDH, OPB15-0DW, OPP20-0D1, OPP20-0D2, OPP20-RD3, OPP20-RD4
- Add-A-Relay power pack - OSA20-000
- High frequency microwave sensors: OSM3D-DDW
- High frequency microwave external fixture mount sensor: OSMHB-VDW
- Self-contained Smart infrared in-fixture mount sensor: ZLD1Z-I0W, ZLDUZ-I0W
- Self-contained Smart infrared external fixture mount sensor: OFD1Z-IXX, OFDUZ-IXX
- Self-contained Solo infrared in-fixture mount sensor: ZLS05-ILW
- Self-contained Solo infrared in-fixture mount sensor: ZLS10-IXX

B. Related Sections: Section(s) related to this section include:

1. Division 16, Lighting Accessories, Lighting Restoration and Repair Sections.
2. Division 16, Wiring Methods, Wiring Devices Section.
3. Division 16, Wiring Methods, Special Purpose Lighting.
4. Division 13, Special Lighting Control.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide occupancy sensor lighting controls and power packs that have been manufactured, assembled, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

B. Performance Testing Requirements

1. Manufacturer shall 100% test all equipment prior to shipment. Sample testing is not acceptable.

C. Code Requirements

1. All occupancy sensor lighting controls and power packs shall be UL listed and either CSA or CUL/US listed.
2. All sensors shall be FCC compliant where applicable.
3. All sensors shall be California Title 24 compliant and listed.
4. Building Codes: All units shall comply with applicable, local building codes.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Bill of Materials: Complete list of all parts needed to fully install selected occupancy sensors.

C. Product Data: Submit product data, including catalog cut sheets for specified products.

D. Shop and Wiring Drawings: Submit shop drawings detailing all mechanical and electrical equipment including one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item.

E. Fixture Compatibility: List of ballasts and lamp combinations compatible with occupancy sensors, by manufacturer and catalog number.

F. Samples: Submit samples for finish, color, and texture.

G. Installation Instructions: Manufacturer's installation instructions.

H. Maintenance Instructions: To remove dust and grime, wipe down units with damp cloth and mild detergent solution. Do not touch the surface of the lens.

I. Closeout Submittals: Warranty documents specified herein

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.

B. Source Limitations: To assure compatibility, obtain occupancy sensors from a single source with complete responsibility over all lighting controls, including accessory products. The use of subcontracted component assemblers is not acceptable.

C. Manufacturer Requirements: The manufacturer will be one who has been continuously engaged in the manufacture of commercial lighting controls and occupancy sensors for no less than 10 years.

D. ISO Certification: Manufacturer shall be ISO-9001 certified.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packages with intact identification labels.

D. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.7 WARRANTY

A. Manufacturer's Warranty: All equipment shall be warranted free of defects in materials and workmanship.

1. Warranty Period: Five years from date of purchase.

2. Owner Rights: Manufacturer's warranty is in addition to, not a limitation of other rights the Owner may have under contract documents.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of design product: Leviton Manufacturing Co. Inc. or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. Leviton Manufacturing Co. Inc.

B. Substitutions:

1. Clearly delineate all proposed substitutions as such and submit in writing for approval by

the design professional a minimum of 10 working days prior to the bid date.

a. Proposed substitutions must be made available to all bidders.

b. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

2. Prior to rough-in, provide complete engineered shop drawings, including power wiring, with deviations from the original design highlighted in an alternate color, to the engineer for review and approval.

3. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 SELF-CONTAINED UNITS

A. General to Wall Switches with Infrared: ODSXX-ID, ODDXX-ID, ODP10-I1, and OSSXX-ID

1. Shall use passive infrared motion detection with tamper resistant PIR lens.
2. Shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
3. Switch shall be microprocessor controlled.
4. Shall be capable of detecting occupancy with true, 180º field of view.
5. Shall utilize zero crossing circuitry, which increases relay life, protects from the effects of inrush current, and increases sensor longevity.
6. Wall switch shall have integral shutters that narrow the field of view from 180º.
7. Shall feature pushbutton for manual on and off, which times out based upon occupancy detection.
8. An LED shall indicate occupancy status.
9. Manual range, photocell, and time settings shall be user-configurable.
10. Switch shall be rated at 120/277V in one unit.
11. Unit shall fit in a standard box and use a standard wallplate, which is gangable.
12. Wall switch shall not protrude more than .4 inches from box.
13. Shall be a Decora style unit with a matching wallplate available.
14. Wall switch must be available in white, ivory, and almond (or equivalent colors).

B. ODS10-ID

1. Sensor shall have four, selectable manual timer settings from 30sec to 30min.
2. Rating: 800W @ 120V, 1200VA @120V, 2700VA @ 277V, and 1/4HP @ 120VAC

C. ODS15-ID

1. No manual adjustment shall be required at the time of installation or during operation.
2. Rating: 10A LED, Electronic Ballast @ 120V/277V; 20A General Purpose @ 120V/277V; 6.67A Tungsten @ 120/277V; 1/4HP @ 120V; 1/3HP @ 277V.
3. Sensor shall provide approximately 1,110 square feet of total coverage, 400 square feet of

minor motion detection.

4. Advanced configuration can be performed using the Leviton Smart Sensor App on any Bluetooth-enabled Android or iOS device, or pushbutton configuration for up to 8 preset options.
5. Sensor shall provide adjustable timeouts of 30sec to 60min.
6. Sensor shall allow multi-way system for up to 5 devices.
7. Sensor shall have an LED night light that illuminates when ambient light levels are below 1 footcandle and turn off when ambient light exceeds 5 footcandles present at the device; Nightlight feature shall be turned on using Smart Sensor App with 12 night light color options available.
8. Shall provide daylighting hold-off calibration using Smart Sensor App.

D. ODD10-ID

1. No manual adjustment shall be required at the time of installation or during operation.
2. Designed for use with 0-10V drivers and ballast and provides 0-10V dimming control.
3. Rating: 8A LED, Electronic Ballast @ 120V; 5A LED, Electronic Ballast @ 277V; 10A General Purpose @ 120/277V; 6.67A Tungsten @ 120/277V; 1/4HP @ 120V; 1/3HP @ 277V.
4. Sensor shall provide approximately 1,110 square feet of total coverage, 400 square feet of minor motion detection.
5. Advanced configuration can be performed using the Leviton Smart Sensor App on any Bluetooth-enabled Android or iOS device, or pushbutton configuration for up to 8 preset options.
6. Sensor shall provide adjustable timeouts of 30sec to 60min.
7. Sensor shall provide capability to program partial-ON levels (1-99%), partial-OFF levels (1-99%) and partial-OFF timeouts from 30sec to infinity using Smart Sensor App.
8. Sensor shall allow multi-way system for up to 5 devices.
9. Sensor shall have an LED night light that illuminates when ambient light levels are below 1 footcandle and turn off when ambient light exceeds 5 footcandles present at the device; Nightlight feature shall be turned on using Smart Sensor App with 12 night light color options available.
10. Shall provide daylighting hold-off calibration using Smart Sensor App.

E. ODD24-ID

1. No manual adjustment shall be required at the time of installation or during operation.
2. 24V dimming wallbox sensor designed for use with Leviton Power Packs (i.e.OPP20) and provides 0-10V dimming control when used with 0-10V drivers or ballasts.
3. Rating: 12-24VDC input; 0.02A input current @ 24VDC.
4. Sensor shall provide approximately 1,110 square feet of total coverage, 400 square feet of minor motion detection.
5. Advanced configuration can be performed using the Leviton Smart Sensor App on any

Bluetooth-enabled Android or iOS device, or pushbutton configuration for up to 8 preset options.

6. Sensor shall provide adjustable timeouts of 30sec to 60min.
7. Sensor shall provide capability to program partial-ON levels (1-99%), partial-OFF levels (1-99%) and partial-OFF timeouts from 30sec to infinity using Smart Sensor App.
8. Sensor shall allow multi-way system for up to 5 devices.
9. Sensor shall have an LED night light that illuminates when ambient light levels are below 1 footcandle and turn off when ambient light exceeds 5 footcandles present at the device; Nightlight feature shall be turned on using Smart Sensor App with 12 night light color options available.
10. Shall provide daylighting hold-off calibration using Smart Sensor App

F. ODP10-I1

1. No manual adjustment shall be required at the time of installation or during operation.
2. Designed for use with dimmable incandescent, LED, or CFL bulbs up to 1000W and provides phase control dimming.
3. Rating: 1000W LED, CFL, Electronic Ballasts, Resistive Tungsten, and Motor @ 120V.
4. Sensor shall provide approximately 1,110 square feet of total coverage, 400 square feet of minor motion detection.
5. Advanced configuration can be performed using the Leviton Smart Sensor App on any Bluetooth-enabled Android or iOS device, or pushbutton configuration for up to 8 preset options.
6. Sensor shall provide adjustable timeouts of 30sec to 60min.
7. Sensor shall provide capability to program partial-ON levels (1-99%), partial-OFF levels (1-99%) and partial-OFF timeouts from 30sec to infinity using Smart Sensor App.
8. Sensor shall allow multi-way system for up to 5 devices.
9. Sensor shall have an LED night light that illuminates when ambient light levels are below 1 footcandle and turn off when ambient light exceeds 5 footcandles present at the device; Nightlight feature shall be turned on using Smart Sensor App with 12 night light color options available.
10. Shall provide daylighting hold-off calibration using Smart Sensor App.

G. ODS0D-ID and ODS0D-T (Title 24 Version)

1. Shall provide switching for 2 separate banks from a single unit.
2. Shall use microprocessor for motion signal analysis and internal, adaptive self-adjustment.
3. Shall save learned and adjusted settings in non-volatile memory that retains all settings during power outages.
4. No manual adjustment shall be required at the time of installation or during operation.
5. Shall automatically adapt to changing room conditions—with the ability to disable adaptive features.
6. Maximum adapted time-out shall not exceed 30 minutes.

7. Walk through feature shall shut off lights within 2.5 minutes after momentary occupancy.
8. Shall offer two modes of operation:
    a. Only one relay responds to photocell.
    b. Both relays respond to photocell and lights return to the previous state on the next cycle (ODS0D-ID).
9. Shall beep before load is automatically switched off.
10. Shall have a 3-position service switch: off, auto, and on (ODS0D-ID).
11. Four, selectable manual timer settings shall be available from 30sec to 20min.
12. Secondary relay shall be manual-on/automatic-off (ODS0D-TD).
13. Ratings: Primary Relay - 800W @ 120V, 1200VA @120V, 2700VA @ 277V @ 120VAC; Secondary Relay - 800W @ 120V, 800VA @120V, 1200VA @ 277V.

H. General to Wall Switches with Multi-Technology: OSSMX-XX

1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies with tamper resistant PIR lens.
2. Shall use passive infrared to turn on and either technology to stay on.
3. Shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
4. Switch shall be microprocessor controlled.
5. Shall be capable of detecting occupancy with true 180º field of view.
6. Shall utilize zero crossing circuitry, which increases relay life, protects from the effects of inrush current, and increases sensor longevity.
7. Wall switch shall have integral shutters that narrow the field of view from 180º.
8. Shall feature pushbutton for manual on and off, which times out based upon occupancy detection.
9. An LED shall indicate occupancy status.
10. Manual range, ultrasonic sensitivity, photocell, and time settings shall be user configurable.
11. Switch shall be rated at 120/277V in one unit.
12. Unit shall fit in a standard box and use a standard wallplate, which is gangable.
13. Wall switch shall not protrude more than .4 inches from box.
14. Shall be a Decora style unit with a matching wallplate available.
15. Wall switch must be available in white, ivory, and almond (or equivalent colors).
16. Shall be available in 40kHz ultrasonic frequencies.
17. Shall have “vacancy confirmation” where if a false off occurs, the sensor shall wait for 45 seconds to determine if space is vacant or not. If occupancy is detected within the 45 second period, either ultrasonic or passive infrared technology can immediately turn the lights back on. If no occupancy is detected within the 45 second period, the sensor will turn off and reset to normal operation of passive infrared on only.

I. OSSMT-XX

1. Shall use microprocessor for motion signal analysis and internal, adaptive self-adjustment.
2. No manual adjustment shall be required at the time of installation or during operation.
3. Shall automatically adapt to changing room conditions—with the ability to disable adaptive features.
4. Shall save learned and adjusted settings in non-volatile memory that retains all settings during power outages.
5. Maximum adapted time-out shall not exceed 30 minutes.
6. Walk through feature shall shut off lights within 2.5 minutes after momentary occupancy.
7. Sensor shall have four, selectable manual timer settings from 30sec to 30min.
8. Rating: 800W @ 120V, 1200VA @120V, 2700VA @ 277V, and 1/4HP @ 120VAC.

J. OSSMD-XX

1. Shall use microprocessor for motion signal analysis and internal, adaptive self-adjustment.
2. No manual adjustment shall be required at the time of installation or during operation.
3. Shall automatically adapt to changing room conditions—with the ability to disable adaptive features.
4. Shall save learned and adjusted settings in non-volatile memory that retains all settings during power outages.
5. Maximum adapted time-out shall not exceed 30 minutes.
6. Walk through feature shall shut off lights within 2.5 minutes after momentary occupancy.
7. Sensor shall have four, selectable manual timer settings from 30sec to 30min.
8. Rating: Primary Relay - 800W @ 120V, 1200VA @120V, 2700VA @ 277V; Secondary Relay - 800W @ 120V, 800VA @120V, 1200VA @ 277V; and 1/4HP @ 120VAC.

K. Self-Contained Provolt™ Line Voltage Infrared Ceiling-Mount: ODCXX-ID, O2CXX-ID, O3CXX-ID, O4CXX-ID

1. Shall use passive infrared motion detection technology with tamper resistant PIR lens.
2. Shall mount on the ceiling.
3. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
4. Shall feature manual timer settings between 30 seconds and 30 minutes.
5. Infrared lenses shall have 360º field of view for up to 12’ mounting heights.
6. Shall include Leviton-exclusive screw guides, coasters, and terminal blocks.
7. Shall be equipped with tamper resistant cover.
8. All controls shall be accessible from front of unit.
9. Rugged, plastic housing shall be available in white.
10. Shall include BMS/emergency interface.

11. Models include occupancy sensors with integrated light sensor (ODCXX-ID, O2CXX-ID), vacancy sensors (O3CXX-ID, O4CXX-ID), and dual relay (O2CXX-ID, O4CXX-ID).
12. Ratings: ODCXX-ID, O2CXX-ID, O3CXX-ID, O4CXX-ID – 800VA @ 120V, 1200VA @ 230V, 1200VA @ 277V.

L. Self-Contained Provolt™ Line Voltage Ultrasonic Ceiling-Mount: ODCXX-UD, O2CXX-UD

1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies with tamper resistant PIR lens.
2. Shall use Doppler shift ultrasonic detection technology.
3. Shall mount on the ceiling.
4. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
5. Shall include integrated light sensor.
6. Shall feature manual timer settings between 30 seconds and 30 minutes.
7. Infrared lenses shall have 360º field of view for up to 12’ mounting heights.
8. Shall include Leviton-exclusive screw guides, coasters, and terminal blocks.
9. Shall be equipped with tamper resistant cover.
10. All controls shall be accessible from front of unit.
11. Rugged, plastic housing shall be available in white.
12. Shall include BMS/emergency interface.
13. Ratings: ODCXX-UD, O2CXX-UD – 800VA @ 120V, 1200VA @ 230V, 1200VA @ 277V.

M. Self-Contained Provolt™ Line Voltage Multi-Technology Ceiling-Mount: ODCXX-MD, O2CXX-MD, O3CXX-MD, O4CXX-MD

1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies with tamper resistant PIR lens.
2. Shall use passive infrared to turn on and either technology to stay on.
3. Shall mount on the ceiling.
4. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
5. Shall feature manual timer settings between 30 seconds and 30 minutes.
6. Infrared lenses shall have 360º field of view for up to 12’ mounting heights.
7. Shall include Leviton-exclusive screw guides, coasters, and terminal blocks.
8. Shall be equipped with tamper resistant cover.
9. All controls shall be accessible from front of unit.
10. Rugged, plastic housing shall be available in white.
11. Shall include BMS/emergency interface.
12. Models include occupancy sensors with integrated light sensor (ODCXX-MD, O2CXX-MD), vacancy sensors (O3CXX-MD, O4CXX-MD), and dual relay (O2CXX-MD, O4CXX-MD).
13. Ratings: ODCXX-ID, O2CXX-ID, O3CXX-ID, O4CXX-ID – 800VA @ 120V, 1200VA

@ 230V, 1200VA @ 277V.

N. Self-Contained Provolt™ Room Controller (PRC) Line Voltage Infrared Ceiling-Mount: O5C04-ID, O6C04-ID
   1. Shall use passive infrared motion detection technology with tamper resistant PIR lens.
   2. Shall mount on the ceiling.
   3. Sensor shall incorporate occupancy/vacancy sensing technology, power pack, and integrated light sensor.
   4. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
   5. Shall feature manual timer settings between 30 seconds and 30 minutes.
   6. Infrared lenses shall have 360º field of view for up to 12’ mounting heights.
   7. Shall include Leviton-exclusive screw guides, coasters, and terminal blocks.
   8. Shall be equipped with tamper resistant cover.
   9. All controls shall be accessible from front of unit.
   10. Advanced configuration shall be performed using the Leviton Provolt App to include settings for timeouts, partial-ON and partial-OFF, daylight zones, and receptacle/HVAC control for secondary relay (O6C04-ID).
   11. Rugged, plastic housing shall be available in white.
   12. Shall include BMS/emergency interface.
   13. Models include primary daylighting control (O5C04-ID) and primary and secondary daylighting control (O6C04-ID).
   14. Ratings: O5C04-ID, O6C04-ID – 800VA @ 120V, 1200VA @ 277V.

O. Self-Contained Provolt™ Room Controller (PRC) Line Voltage Multi-Technology Ceiling-Mount: O5C20-MD, O6C20-MD
   1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies with tamper resistant PIR lens.
   2. Shall use passive infrared to turn on and either technology to stay on.
   3. Shall mount on the ceiling.
   4. Sensor shall incorporate occupancy/vacancy sensing technology, power pack, and integrated light sensor.
   5. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
   6. Shall feature manual timer settings between 30 seconds and 30 minutes.
   7. Infrared lenses shall have 360º field of view for up to 12’ mounting heights.
   8. Shall include Leviton-exclusive screw guides, coasters, and terminal blocks.
   9. Shall be equipped with tamper resistant cover.
   10. All controls shall be accessible from front of unit.
   11. Advanced configuration shall be performed using the Leviton Provolt App to include settings for timeouts, detection technology selection, partial-ON and partial-OFF, daylight zones, and receptacle/HVAC control for secondary relay (O6C04-ID).
   12. Rugged, plastic housing shall be available in white.

13. Shall include BMS/emergency interface.
14. Models include primary daylighting control (O5C20-MD) and primary and secondary daylighting control (O6C20-MD).
15. Ratings: O5C04-ID, O6C04-ID – 800VA @ 120V, 1200VA @ 277V.

P. Self-Contained Infrared Ceiling-Mount: ODC0S-IXW

1. Shall mount on the ceiling.
2. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
3. Shall feature manual timer settings between 20 seconds and 15 minutes.
4. Infrared lenses shall have 360º field of view.
5. Shall be equipped with tamper resistant cover.
6. All controls shall be accessible from front of unit.
7. Rugged, plastic housing shall be available in white.
8. Ratings: ODCOS-I1 – 1000W/VA @ 120V, and ODC0S-I7 – 2700W/VA @ 277V.

Q. Self-Contained Infrared Fixture-Mount: OSFHU-XX, OSFHW-XX, OSFHP-XX, OSFHS-XX, HB011-XX

1. Shall mount on the fixture through a standard ½” knockout or to an electrical junction box.
2. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lenses shall include two lenses for up to 40’ mounting heights, a 360º high bay and 360º low bay lens, and include a mask for aisle way.
5. Shall be equipped with tamper resistant cover.
6. All controls shall be accessible on unit.
7. Rugged, plastic housing shall be available in white.
8. Models include cold storage (OSFHU-CX), IP65 rated (OSFHW-XX), integrated light sensor (OSFHP-XX), 24V (OSFHW-IL), surface/recess mount (OSFHS-XX), and 0-10V dimming (HB011-XX).
9. Ratings: OSFHU-XX – 800VA @ 120V, 1200VA @ 277V, 1500VA @ 347V, 2000VA @ 480V, and 1/4HP @ 120V. OSFHW-XX – 800VA @ 120V, 1200VA @ 277V, 1500VA @ 347V, and 1/4HP @ 120V. OSFHP-XX – 800VA @ 120V, 1000VA @ 230V, 1200VA @ 277V, 1500VA @ 347V, 2000VA @ 480V, and 1/4HP @ 120V. OSFHP-IL – 20mA input, 120mA output, and 1A, 30VDC HVAC. OSFHS-XX – 800VA @ 120V, 1200VA @ 277V, 1500VA @ 347V, and 1/4HP @ 120V. HB011-XX – 800VA @ 120V, 1000VA @ 230V, 1200VA @ 277V, and 1/4HP @ 120V

R. Self-Contained Infrared In-Fixture Mount: OSF20-XX

1. Shall mount directly in the fixture.
2. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lenses shall include two lenses for up to 40’ mounting heights, a 360º high bay and 360º low bay lens, and include a mask for aisle way.

5. Shall be equipped with tamper resistant cover.
6. All controls shall be accessible on unit.
7. Rugged, plastic housing shall be available in white.
8. Shall be IP65 rated.
9. Ratings: OSF20-IU – 800VA @ 120V, 1200VA @ 277V, 800W @ 120V, and 1/4HP @ 120V. OSF20-IL – 20mA input, 120mA output, and 1A, 30VDC HVAC.

S. Self-Contained Infrared In-Fixture Mount: OSF10-XX

1. Shall mount directly in the fixture.
2. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lens shall include lens for up to 8’ mounting heights.
5. Shall be equipped with tamper resistant cover.
6. All controls shall be accessible on unit.
7. Rugged, plastic housing shall be available in white.
8. Ratings: OSF10-XX – 800VA @ 120V, 1200VA @ 277V, 800W @ 120V, and 1/6HP @ 120V.

T. General to Low Voltage Sensors and Accessories: OSCXX, OSWXX

1. Shall use microprocessor for motion signal analysis and internal, adaptive self-adjustment.
2. No manual adjustment shall be required at the time of installation or during operation.
3. Shall automatically adapt to changing room conditions.
4. Shall identify, record, and learn a room’s normal occupancy cycles to automatically adjust the sensitivity threshold.
5. Shall save learned and adjusted settings in non-volatile memory that retains all settings during power outages.
6. Shall recognize motion detected within 20 seconds of turning off lighting, as a false off. In response to a false off, the microprocessor shall increase sensitivity, and increase the time-off setting.
7. Sensor shall recognize as a false on the failure. The sensor shall decrease the sensitivity in response to a false on.
8. Sensor shall feature a 6-second time-out install test mode, which will automatically revert to standard time-out no longer than one hour after test mode is initiated. Sensor shall have manual controls and override switches to force manual adjustments.
9. Shall provide a concealed bypass switch to force on lighting.
10. Sensitivity shall be adjustable from 0% to 100%.
11. Control knobs shall set the initial settings for automatic sensitivity adjustments.
12. Shall have a switch for restoring factory settings.
13. Timer shall be manually selectable between 30 sec. and 30 minutes.
14. Photocell shall be available. Photocell shall prevent lighting from coming on when the ambient light levels are above the set point.

15. Shall be equipped with tamper resistant cover.
16. All controls shall be accessible from front of unit.
17. Rugged, plastic housing shall be available white
18. Shall accept Class 2 wiring.

U. Low-Voltage Multi-Technology Ceiling-Mount: OSC20-MXW, OSC10-MXW, OSC05-MXW, OSC20-RMW, OSC10-RMW
1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies.
2. Shall mount on the ceiling.
3. Shall be available in 180º and 360º coverage patterns.
4. Infrared lenses shall have a 360º field of view.
5. Shall be available in 40kHz ultrasonic frequencies.
6. Shall automatically adapt to changing room conditions—including background PIR levels and continuous airflow.
7. Sensor shall have two modes of operation:
   a. Multi-technology mode: where the sensors send infrared signal to the microprocessor, which makes the decision to turn on lighting based on the level of the signal.
   b. Single technology mode: where the user chooses technology that will turn on lighting.
8. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
9. Shall have mask inserts for PIR rejection to prevent false tripping.
10. Models OSCXX-RXX includes isolated relay.

V. Low-Voltage Ultrasonic Ceiling-Mount: OSC20-UXW, OSC10-UXW, OSC05-UXW
1. Shall utilize Doppler shift ultrasonic detection technology.
2. Shall mount on the ceiling.
3. Shall be available in 180º and 360º coverage patterns.
4. Shall be available in 40kHz ultrasonic frequencies.
5. Shall automatically adapt to continuous airflow conditions.
6. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
7. Operating status and setting confirmation shall be available via LED motion indicators.
8. Models OSCXX-RXX includes isolated relay.

W. Low-Voltage Infrared Ceiling-Mount: OSC04-I, OSC15-I.
1. Shall utilize passive infrared motion detection.
2. Shall mount on the ceiling.
3. Shall automatically adapt to changing background PIR levels.
4. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
5. Infrared lenses shall have 360º field of view.

6. Shall have mask inserts for PIR rejection to prevent false tripping.

X. Low-Voltage Multi-Technology Wall/Corner Mount Sensors: OSW12-MXW, OSW12-RMW

1. Shall incorporate Doppler shift ultrasonic and passive infrared motion detection technologies.
2. Shall mount on ceiling or wall via supplied mounting bracket.
    a. Mounting bracket shall have a place to conceal the wiring connections.
3. Shall automatically adapt to changing room conditions—including background PIR levels and continuous airflow.
4. Sensor shall have two modes of operation:
    a. Multi-technology mode: where the sensors send infrared and ultrasonic signals to the microprocessor, which makes the decision to turn on lighting based on the level of each signal.
    b. Single tech mode: where the user chooses technology which will turn on lighting.
5. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
6. Shall have at least a 110° coverage pattern.
7. Shall utilize 40kHz ultrasonic frequency.
8. Models OSWXX-RXX includes isolated relay.

Y. Low-Voltage Infrared Wall/Corner Mount Sensors: OSWWV-IXW, OSWHB-IXW, OSWLR-IXW, OSWWV-RIW, OSWHB-RIW, OSWLR-RIW

1. Shall utilize passive infrared motion detection.
2. Shall be available in wide view, long range, and high bay infrared lenses.
3. Shall mount on ceiling or wall via supplied mounting bracket.
    a. Mounting bracket shall have a place to conceal the wiring connections and provide knockout for surface wire raceway.
4. Shall automatically adapt to changing background PIR levels.
5. Shall incorporate a real-time motion indicator LED, which is visible from the front of unit.
6. High bay sensor shall have a linear range of at least 60 feet.
7. Models OSWXX-RXX includes isolated relay.

Z. Power Pack: OSP20-ODO, OSP20-RDH

1. Shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
2. Ratings: OSP20-XD0 – 20A incandescent, 20A fluorescent; OSP20-XD0 – 20A fluorescent @ 50Hz or 60Hz; OSP20-070 – 20A fluorescent; and ODP15-030/OPB15-0DW – 15A fluorescent. Shall utilize normally open, silver alloy dry contacts rated for a 20A-ballast load at 120V, 230V, 277V, and 15A at 347V.
3. Relay function shall not require more than 5-ma control current to operate.
4. Power Pack shall allow for separation of Class 1 and Class 2 wiring.
5. Power Pack shall provide Manual ON, HOLD-ON, and HOLD-OFF functions and be compatible with low-voltage switches. (OSP20-RDH)

6. Power Pack Mounting Specifications (OSPXX-XXX)
    a. Shall fit inside the ballast cavity of a fluorescent fixture and shall be qualified for installation in a ballast cavity.
    b. Shall be sized to fit inside a standard, 4” x 4” junction box.
    c. Shall be mountable to a 1/2in. knockout within a ballast cavity on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
    d. Shall be mountable to a 1/2in. knockout within a ballast cavity on the low voltage end, such that it may be mounted to the inside of a ballast cavity with the box and line voltage wiring internal to the cavity and the low voltage wiring external.
7. Power Pack Mounting Specifications (OP15-0DW)
    a. Shall fit inside a 4” x 2.125” deep octagon or a 4” x 2.125” deep square with mud ring electrical junction box.
8. Models OSPXX-RXX includes HVAC relay in power pack.
9. HVAC Relay – SPDT 500ma@24VDC three-wire isolated. Ratings: .5A, 125VAC; 1A, 30VDC.

AA. Add-A-Relay: OSA20-R00

1. Relay shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
2. Control module shall interface with and control two- and three-wire relays from GE, Reliant and Douglas.
3. Add-A-Relay shall accept 24VAC full-wave or half-wave rectified power.
4. Control Module Output
    a. Output for relay control shall be dry contact closure, not solid state switching.
    b. Shall be an “ON” dry contact closure of at least 150ms when blue wire transitions from low to high.
    c. Shall be an “OFF” dry contract closure of at least 150ms when blue wire transitions from high to low.
5. Add-A-Relay Mounting Specifications
    a. Shall fit inside the ballast cavity of a fluorescent fixture and shall be qualified for installation in a ballast cavity.
    b. Shall be sized to fit inside a standard, 4” x 4” junction box.
    c. Shall be mountable to a 1/2in. knockout within a ballast cavity on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
    d. Shall be mountable to a 1/2in. knockout within a ballast cavity on the low voltage end, such that it may be mounted to the inside of a ballast cavity with the box and line voltage wiring internal to the cavity and the low voltage wiring external.
6. Models OSPXX-RXX includes HVAC Relay in power pack.
7. HVAC Relay – SPDT 500ma@24VDC three-wire isolated. Ratings: .5A, 125VAC; 1A, 30VDC.

BB. High Frequency Microwave Sensors: OSM3D-DDW

1. Shall utilize high frequency electromagnetic microwave detection technology.
2. Shall include 0-10V dimming technology.
3. Shall mount behind low-density fixture materials, in fixture, or behind objects made of plastic or glass.
4. Shall include integrated light sensor.
5. Shall be available in 150º wall and 360º ceiling coverage patterns for up to 49’ mounting heights.
6. Shall feature manual timer settings between 5 seconds and infinity.
7. All controls shall be accessible on unit.
8. Shall be IP20 rated.
9. Ratings: OSM3D-DDW – 400W @ 120VAC, 800W @ 220-240VAC, 1000W @ 277VAC.

CC. High Frequency Microwave Fixture-Mount: OSMHB-VDW

1. Shall utilize high frequency electromagnetic microwave detection.
2. Shall include 0-10V dimming technology.
3. Shall mount on the fixture through a standard ½” knockout or to an electrical junction box.
4. Shall include integrated light sensor.
5. Shall feature 360º ceiling coverage patterns for up to 50’ mounting heights.
6. Shall feature manual timer settings between 10 seconds and 15 minutes.
7. All controls shall be accessible on unit or adjustable with optional IR remote (ZLS0R).
8. Shall be IP20 rated.
9. Ratings: OSMHB-VDW – 660W @ 120VAC, 800W @ 120VAC, 1200W @ 277VAC.

DD. Self-Contained Smart Infrared In-Fixture Mount Sensor: ZLD1Z-I0W, ZLDUZ-I0W

1. Shall mount directly in the fixture.
2. Shall integrate 0-10V dimming control.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lenses shall include two lenses for up to 40’ mounting heights, a 360º high bay and 360º low bay lens, and include a mask for aisle way.
5. Advanced configuration shall be performed using the Leviton Smart Sensor App to include settings for sensitivity, timeouts, mesh grouping, partial-ON and partial-OFF, daylight control, and scheduling (ZLDUZ-I0W).
6. Shall be equipped with tamper resistant cover.
7. Rugged, plastic housing shall be available in white.
8. Shall be IP66 rated.
9. Ratings: ZLD1Z-I0W, ZLDUZ-I0W – 800W @ 120V, 1150W @ 230V, 1400W @ 277V, 1700W @ 347V, and 2400W @ 480V

EE. Self-Contained Smart Infrared External Fixture Mount Sensor: OFD1Z-IXX, OFDUZ-IXX

1. Shall mount on the fixture through a standard ½" knockout
2. Shall integrate 0-10V dimming control.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lenses shall include two lenses for up to 40' mounting heights, a 360º high bay and 360º low bay lens, and include a mask for aisle way.
5. Advanced configuration shall be performed using the Leviton Smart Sensor App to include settings for sensitivity, timeouts, mesh grouping, partial-ON and partial-OFF, daylight control, and scheduling (OFDUZ-IXX).
6. Shall be equipped with tamper resistant cover.
7. Rugged, plastic housing shall be available in white.
8. Shall be IP66 rated.
9. Ratings: OFD1Z-IXX, OFDUZ-IXX – 800W @ 120V, 1150W @ 230V, 1400W @ 277V, 1700W @ 347V, and 2400W @ 480V.

FF. Self-Contained Solo Infrared In-Fixture Mount Sensor: ZLS05-ILW

1. Shall mount directly in the fixture.
2. Shall integrate 0-10V dimming control and light sensor.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lens shall include a 360º coverage pattern for up to 10' mounting heights.
5. Shall be configurable with DIP switches on the device or remote control (ZLS0R-RA1) to include settings for task levels, timeouts, partial-ON and partial-OFF, and daylight control.
6. Shall be IP20 rated.

GG. Self-Contained Solo Infrared In-Fixture Mount Sensor: ZLS10-IXX

1. Shall mount directly in the fixture.
2. Shall integrate 0-10V dimming control and light sensor.
3. Shall feature manual timer settings between 30 seconds and 30 minutes.
4. Infrared lens shall include a 360º coverage pattern for up to 40' mounting heights.
5. Shall be configurable with DIP switches on the device or remote control (ZLS0R-RC1) to include settings for sensitivity, timeouts, partial-ON and partial-OFF, and daylight control.
6. Shall be IP65 rated.
7. Ratings: ZLS10-IXX – 800W @ 120V, 1200W @ 277V, 660W @ 120V, and 1200W @ 277V.

PART 3 EXECUTION

3.1 PREPARATION

A. Site Verification: Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.

B. Inspection: Inspect all material included in this contract prior to installation. Manufacturer shall

be notified of unacceptable material prior to installation.

3.2 INSTALLATION

A. The Electrical Contractor, as part of the work of this section, shall coordinate, receive, mount, connect, and place into operation all equipment. The Electrical Contractor shall furnish all conduit, wire, connectors, hardware, and other incidental items necessary for properly functioning lighting control and occupancy sensors as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by manufacturer without defects, damage, or failure.

1. Compliance: Contractor shall comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.

B. Power: The contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.

C. Related Product Installation: Refer TO OTHER SECTIONS LISTED IN RELATED SECTIONS FOR RELATED PRODUCTS' INSTALLATION.

3.3 TESTING

A. Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, a qualified factory representative shall completely check the installation prior to energizing the system. Each installed occupancy sensor shall be tested in the test mode to see that lights turn off and on based on occupancy.

B. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

3.4 PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of installation including preparation, testing, and cleanup.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Engraved nameplates for each circuit breaker on Power Panelboards

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. MCCB: Molded-case circuit breaker.

E. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.

7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing**.**

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components 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 overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 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. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: See schedules on plans.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. 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 no fewer than 7 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Architect's, Construction Manager's and Owner's written permission.
3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

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 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
7. Finishes:

    a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Same finish as panels and trim.

G. Incoming Mains:

1. Location: coordinated on the field by the electrical contractor.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

    a. Plating shall run entire length of bus.
    b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
5. Split Bus: Vertical buses divided into individual vertical sections.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.3 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1 or Type 2 (as noted on plans).

2.4 POWER PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

C. Mains: Circuit breaker or Lugs only (as noted on plans).

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker or Lugs only (as noted on plans).

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Circuit Breakers:

    a. RMS sensing.
    b. Field-replaceable rating plug or electronic trip.
    c. Digital display of settings, trip targets, and indicated metering displays.
    d. Multi-button keypad to access programmable functions and monitored data.
    e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    f. Integral test jack for connection to portable test set or laptop computer.
    g. Field-Adjustable Settings:

        1) Instantaneous trip.
        2) Long- and short-time pickup levels.
        3) Long and short time adjustments.
        4) Ground-fault pickup level, time delay, and I squared T response.
4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching LED lighting loads.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional with field-adjustable 0.1- to 0.6-second] time delay.
    i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
    j. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    k. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    l. Multipole units enclosed in a factory assembled to operate as a single unit.
    m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.7 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Computer-generated circuit directory card mounted inside panelboard door mounted in metal frame with transparent plastic protective cover.

1. The circuit directory shall identify specific purpose with sufficient detail to distinguish it from all other circuits.

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing them from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

D. Equipment Mounting:

1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." and or Section 033053 "Miscellaneous Cast-in-Place Concrete."
2. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

J. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

K. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

M. Install filler plates in unused spaces.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in Power Panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. 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.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. 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 panelboard. 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 panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. 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."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Tamper-resistant receptacles.
4. Weather-resistant receptacles.
5. Snap switches.
6. Pendant cord-connector devices.
7. Cord and plug sets.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and processes used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; a division of Eaton.
   2. Wiring Device-Kellems; a division of Hubbell.
   3. Leviton Mfg. Company Inc.
   4. Pass & Seymour; a division of LeGrand.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, 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.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

2.4 GFCI RECEPTACLES

A. General Description:

   1. Straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

2.5 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles: Comply with NEMA WD 1, NEMA WD 6 Configuration as per plans and UL 498.

2.7 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations as per plans, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.9 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole
2. Two Pole
3. Three Way
4. Four Way

C. Key-Operated Switches, 120/277 V, 20 A:
   1. Description: Single pole, Corbin type with factory-supplied key in lieu of switch handle.

2.10 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

   1. Plate-Securing Screws: Tamper proof metal with head color to match plate finish.
   2. Material for Finished Spaces: Type 302 stainless steel, 0.04-inch thick.
   3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.11 FINISHES

A. Device Color:

   1. Wiring Devices Connected to Normal Power System: White.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade convenience outlets in patient-care area and hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

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. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Enclosed controllers.
c. Enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," and or **S**ection 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
4. Coordination charts and tables and related data.

1.5 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.; Bussmann Div.
2. Mersen

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

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.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

SECTION 262813 - FUSES

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Main Service:
    a. 70-600A: Class RK1, time delay, current limiting.
        1) 250volts - Bussmann LOW-PEAK LPN-RK dual element.
        2) 600volts – Bussmann LOW-PEAK LPS-RK dual element.
2. Main Feeders: Class RK1, time delay.
    a. 250volts - Bussmann LOW-PEAK LPN-RK dual element.
    b. 600volts – Bussmann LOW-PEAK LPS-RK dual element.
3. Motor Branch Circuits: Class RK1, time delay.
    a. 250volts - Bussmann LOW-PEAK LPN-RK dual element.
    b. 600volts – Bussmann LOW-PEAK LPS-RK dual element.
4. Power Electronics Circuits: Class J, high speed.
5. Control Transformer Circuits: Class CC, time delay, and control transformer duty.
6. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

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. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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

indicated 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. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. 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;
3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 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 262913 - ENCLOSED 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 the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
1. Full-voltage magnetic.
2. Multispeed.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.

e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field quality-control reports.

C. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

1.7 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. 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.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers.

1.9 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 Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect and or Construction Manager no fewer than seven days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary utilities.
3. Do not proceed with interruption of electrical systems without Architect's and or Construction Manager's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

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. Siemens.
3. Eaton Corporation.
4. General Electric ABB.

2.2 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
1. Configuration: Non-reversing or two speed (as noted on drawings).
2. Surface mounting.
3. Red and Green pilot light.
4. Additional Nameplates: HIGH and LOW for two-speed switches.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
1. Configuration: Non-reversing.
2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button melting alloy type.
3. Surface mounting.
4. Red pilot light.

D. Integral Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
1. Configuration: Non-reversing.
2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button melting alloy type.
3. Surface] mounting.
4. Red pilot light.
5. N.C. auxiliary contact.

E. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Configuration: Non-reversing.
2. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

3. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
4. Control Circuits: 24 V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 100 VA.

5. Solid-State Overload Relay:

a. Switch or dial selectable for motor running overload protection.
b. Sensors in each phase.
c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
e. Analog communication module.

6. N.C. and N.O., isolated overload alarm contact.
7. External overload reset push button.

F. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
3. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O. /N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.C. and N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current

element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. N.C. and N.O. alarm contact that operates only when MCCB has tripped.

2.3 MULTISPEED MAGNETIC CONTROLLERS

A. General Requirements for Multispeed Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Multispeed Magnetic Controllers: Two speed, full voltage, across the line, electrically held.

1. Configuration: Non-reversing; two winding.
2. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

3. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
4. Control Circuits: 24-V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: **100** VA.

5. Compelling relays shall ensure that motor will start only at low speed.
6. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
7. Decelerating timer relays shall ensure automatically timed deceleration through each speed.
8. Antiplugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.
9. Solid-State Overload Relay:

    a. Switch or dial selectable for motor running overload protection.
    b. Sensors in each phase.
    c. Class 10/20 selectable] tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    e. Analog communication module.

10. N.C. and N.O., isolated overload alarm contact.
11. External overload reset push button.

C. Combination Multispeed Magnetic Controller: Factory-assembled combination of reduced-voltage magnetic controller, OCPD, and disconnecting means.

1. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

2. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.C. or N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

4. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
N.C.or N.O. alarm contact that operates only when MCCB has tripped.

2.4 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.

2. Outdoor Locations: Type 3R.

2.5 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy type.

a. Push Buttons: Shielded types; momentary as indicated.
b. Pilot Lights: LED types; colors as indicated; push to test.
c. Selector Switches: Rotary type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours.
3. Meters: Panel type, 2-1/2-inch minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.

B. Reversible N.C./N.O. auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in Type 4, Type 4X, Type 7, and Type 9 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Cover gaskets for Type 1 enclosures.

G. Terminals for connecting power factor correction capacitors to the load side of overload relays.

H. Spare control wiring terminal blocks, quantity as indicated wired.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Install fuses in each fusible-switch enclosed controller.

C. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

D. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

E. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

F. Install power factor correction capacitors. Connect to the load side of overload relays. If connected to the load side of overload relays, adjust overload heater sizes to accommodate the reduced motor full-load currents.

G. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified 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 nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. 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.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect/ Construction Manager before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) 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 multi-pole enclosed controller. 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 multi-pole enclosed controller 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.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed controllers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect/Construction Manager before increasing settings.

D. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 262913

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

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 field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. The Surge Protection Device (SPD) covered under this section includes all service entrance type surge protection devices suitable for use as Type 1(Service Entrance) or Type 2 (Distribution Panels) devices per UL1449 3rd Edition, applied to the line or load side of the utility feed inside the facility.

C. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devises.

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Package must include shop drawings complete with all technical information, unit dimensions, detailed installation instructions, maintenance manual, recommended replacement parts list and wiring configuration.

B. Copies of Manufacturer's catalog data, technical information and specifications on equipment proposed for use.

C. Copies of documentation stating that the Surge Protection Device is listed by UL to UL1449 3rd Edition, category code VZCA.

D. Copies of actual let through voltage data in the form of oscillograph results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.

E. Copies of Noise Rejection testing as outlined in NEMA LS1-1992 (R2000) Section 3.11. Noise rejection is to be measured between 50 kHz and 100 MHz verifying the devices noise attenuation. Must show multiple attenuation levels over a range of frequencies.

F. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.

G. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

H. Field quality-control reports.

I. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:

1. UL 1449 3rd Edition 2009 Revision (effective 9/29/2007).
2. UL 1283.
3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
5. UL96A
6. IEEE 1100 Emerald Book.
7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Fifteen years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers:

1. ACT Communications
2. Others prior approval required before bid.

2.2 GENERAL SPD REQUIREMENTS

A. SPD with 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.

C. Comply with UL 1449.

D. Comply with UL 1283.

E. MCOV of the SPD shall be the nominal system voltage.

F. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449 3rd Edition, section 37.7.3. MCOV values claimed based on the component’s value or on the 30-minute 115% operational voltage test, section 38 in UL1449 will not be accepted.

G. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.

1. SPD shall include an EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.

H. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.

I. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA

J. The SCCR rating of the SPD shall be 200kAIC without the need for upstream over current protection.

K. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall be no less than noted on plans The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

L. The SPD shall have the following monitoring options through the M3 Mastermind monitoring system.

1. Time Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase)
2. SPD monitoring shall track surge protection and display it as a percentage of remaining protection.
3. SPD shall provide a surge counter with three categories to be defined as
4. Low Level surge (100A-500A) Medium Level surge (500A-3,000A) High Level surge (>3,000A)
5. Remote communications via Ethernet using the M4E Monitoring Option
6. Unit shall be equipped with an integral Test Port Compliant with the DTS-2 Testing Unit.
7. Indicator light display for protection status.

M. ENCLOSURES

1. Indoor Enclosures: NEMA 250, Type 1.
2. Outdoor Enclosures: NEMA 250, Type 4.

2.3 SERVICE ENTRANCE SUPPRESSOR

A. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

B. Unit shall have no more than 10% deterioration or degradation of the UL1449 3rd Edition Voltage Protection Rating (VPR) when exposed to a minimum of 14,000 repeated categories C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.

C. Protection Modes UL1449 3rd Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 3rd Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave 6kV, 500A	C3 Comb. Wave 20kV, 10kA	UL 1449 Third Edition VPR Rating
120/240, 120/208	L-N	150	490	980	700
	L-G	150	570	980	700
	N-G	150	640	1170	700
	L-L	300	500	1600	1200
277/480	L-N	320	450	1420	1200
	L-G	320	540	1540	1200
	N-G	320	570	1600	1000
	L-L	552	530	2600	2000

D. The unit shall be able to prevent common temporary overvoltages and high impedance faults from damaging the MOVs, increasing their longevity and ability to protect the critical load. Limited and Intermediate current TOVs (as specified in UL 1449 article 39.3 and 39.4) can be caused by a loss of the neutral conductor in a split phase or three phase power system. The available fault current will be determined by the impedance of the loads connected to the phases opposite the SPD and are typically in the range of 30A to 1000A. The Selenium elements must limit voltage to the MOV as a percent of nominal as outlined below:

Overvoltage seen by MOVs as % of Nominal				
	available current			
time	30A	100A	500A	1000A
1 cycle	120%	130%	150%	160%
10 cycles	130%	150%	160%	160%
30 cycles	140%	150%	160%	160%

*To verify damage to the MOVs has been mitigated, the percent overvoltage seen at the MOV must be less than 200% for split-phase applications or 173% for three-phase applications (100% is nominal).

E. The unit shall be able to withstand multiple TOVs without damage to the MOVs by shunting current away from the MOVs during the overvoltage. SPD must have the ability to withstand >100 TOVs with a source current of 30A, duration of 30 cycles, with10s between TOV events.

F. The service entrance protector shall incorporate a combination of TPMOV and Selenium technology allowing for transient surge and temporary over voltage protection.

G. Integral Disconnect Switch (REQUIRED)

1. The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
2. The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.
3. The switch shall be rated for 600Vac.
4. The SPD device shall be tested to UL1449 3rd Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.

5. The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
6. The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.

2.4 PANEL SUPPRESSORS

A. SPDs: Comply with UL 1449, Type 2.

1. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

B. Unit shall have no more than 10% deterioration or degradation of the UL1449 3rd Edition Voltage Protection Rating (VPR) when exposed to a minimum of 5,000 repeated categories C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.

C. Protection Modes UL1449 3rd Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 3rd Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave 6kV, 500A	C3 Comb. Wave 20kV, 10kA	UL 1449 Third Edition VPR Rating
120/240, 120/208	L-N	150	760	2020	900
	L-G	150	800	1890	900
	N-G	150	930	2330	1200
	L-L	300	790	250	900
277/480	L-N	320	740	2460	1200
	L-G	320	790	2460	1500
	N-G	320	900	2640	1200
	L-L	552	870	3390	2000

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. If installed lead length exceeds 5’ installer shall use a low impedance (HPI) cable to reduce the lead lengths effect on the installed performance of the SPD.

C. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 265116 - INTERIOR LIGHTING

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. Interior LED luminaires and drivers.
2. Luminaire supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. BIM: Building information model.

B. CAD: Computer-aided design.

C. CCT: Correlated color temperature.

D. CRI: Color Rendering Index.

E. LED: Light-emitting diode.

F. Fixture: See "Luminaire."

G. IP: International Protection or Ingress Protection Rating

H. Lumen: Measured output of lamp and luminaire, or both.

I. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.
4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps, drivers, and accessories identical to those indicated for the luminaire as applied in this Project. For LED light fixtures the adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80

    a. Retain or "Manufacturers' Certified Data" or "Testing Agency Certified Data" Subparagraph below. Retain first subparagraph if photometric data, based on testing by accredited manufacturers' laboratories, is considered adequate for luminaires in this Project. Retain second subparagraph if photometric data for one or more luminaires are based on independent laboratory tests; coordinate with the Interior Lighting Fixture Schedule on Drawings to indicate which units shall meet this requirement. See the Evaluations. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
6. Include documentation verifying light fixture efficiency by providing one of the following:

    a. Screenshot of DLC website listing the light fixture. Can be found at https://www.designlights.org
    b. Screenshot of Energy Star website listing the light fixture. Can be found at https://www.energystar.gov
    c. Part efficiency documentation in the form of 3rd party certified lab tested LM-79 or LM-80 documents with additional supporting documents linking the part model to the light fixture model.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

D. Qualification Data: For testing laboratory providing photometric data for luminaires.

E. Product Certificates: For each type of luminaires driver, from manufacturer.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.5 PRIOR APPROVAL SUBMITTAL REQUESTS

A. Full submittal data , by type, clearly highlighted and arrowed to identify the specific proposed manufacturer's nomenclature

B. Full submittal data of lamp and proposed manufacturer.

C. Full submittal data of driver (LED) of proposed manufacturer

D. LED lumen data will include
   1. Lumen output
   2. L70 and L90 testing
   3. Confirmation of independent test lab data ITL
   4. Color temperature and CRI with quantity of McAdam Ellipse steps
      a. Data shall include sphere and goniometer results for total lumen, total power, luminaire efficacy, CRI and junction temperature for the specified color temperature
   5. Make and brand of LED diode should be clearly identified on submittal data

E. LED dimming shall be equal in range and quality to the specified drivers, Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.

F. All substitutions must meet specified fixtures certifications (UL,ETL,CE,CSA, RoHS, DLC, Energy Star)

G. Provide lighting calculations with the prior approval request based on reflectance values and light loss factors provided by the engineer and displayed on lighting calculation drawings. (may be unique by area) Calculations shall be shown on one sheet with dimensions as shown on construction set. Data will be submitted electronically in dxf format on a flash drive and with printed calculations on Architectural E size sheets to scale with construction set sheets.

   1. Discrepancies between prior approval data calculations and the original design calculations will result in immediate disqualification of review due to time based constraints on the bid process

H. Prior approval request may require a sample of both the proposed and specified fixtures provided by the alternate manufacturer at NO additional cost to the project. Samples of both specified and proposed must be provided within 10 working days of request.

I. All data will be submitted electronically and in a bound format

J. Bound data will be secured in hard binder with 3" rings for ease of review or PDF file.

   1. Types will be marked with a tab by type and indexed for ease of reference

K. LED warranty information MUST be included by type and marked in RED to clearly identify the manufacturer's warranty terms. Warranty data MUST meet or exceed the specified manufacturers terms

L. Prior approvals MUST be received and acknowledged to the specifier's office no less than 10 days prior to bid.

M. ALL prior approval data must be submitted in one package with complete information. Information that is incomplete will be rejected without review.

N. The prior approval will be returned marked approved or rejected by type with no explanation. If any specification is deemed not equal the review will be stopped, the type rejected with no explanation.

O. Lumen output for the proposed fixture must be highlighted in yellow for clear identification.

P. All inverter systems supply power to LED fixtures must have pure PWM sine wave function and work with any type of lighting load.

Q. LED warranty information must be included by type and marked in red to clearly identify the manufacturer's warranty terms. Warranty data must meet or exceed the specified manufacturer's terms.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Fluorescent-luminaire-mounted emergency battery pack: One for every 40 emergency lighting unit.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as

defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

A. LED luminaires
   1. Provide from a single manufacturer for each luminaire type.
   2. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace (materials and labor) components of luminaires that fail in materials or workmanship within specified warranty period.

   1. Warranty Period: Five year(s) from date of Substantial Completion

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

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. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. Recessed Luminaires: Comply with NEMA LE 4.

G. EMI Filters: Factory installed to suppress conducted EMI according to MIL-STD-461E. Fabricate luminaires with one filter on each driver indicated to require a filter.

2.2 EMERGENCY POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with driver. Comply with UL 924.

1. Emergency Connection: Operate LED's continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire driver.
2. Test Push Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
5. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from luminaire. Comply with UL 924.

1. Emergency Connection: Operate lamps continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire driver.
2. Battery: Sealed, maintenance-free, nickel-cadmium type.
3. Charger: Fully automatic, solid-state, constant-current type.
4. Housing: NEMA 250, Type 1 enclosure.
5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
7. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.3 LED LIGHTING FIXTURES AND LED LAMPS

A. All LED products must be UL, ETL and/or CSA listed

B. All LED products must have LM-79 and LM-80 testing noted on specification sheet by an independent test lab

C. All LED products should be identified as L70 and/or L90 ratings based on independent test lab data

D. All outdoor and wet location listed products must clearly state the IP rating carried on the fixture based on independent test lab data

E. Bulb shape complying with ANSI C79.1.

F. CRI of Minimum 80. CCT of 4100 K.

G. Rated lamp life of **50,000** hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Nominal Operating Voltage: as noted on light fixture schedule.

J. All LED products must be serviceable for accessible for field repair needs

K. All indoor lighting color rendering should be within a 3 step McAdams ellipse. All indoor lighting should be 4000-4100 kelvin unless specifically noted

L. All control systems that interface with an LED product will be supported by a project "integrator" until project completion. This includes contact with the installer prior to installation, availability during installation, and final checkout and startup after installation. The quantity of days required for startup will be based on the manufacturer/agents discretion and need.

1. The project integrator must be capable of performing low voltage and dmx terminations. High voltage terminations are performed solely by the electrical subcontractor.
2. Reporting of final startup completion of the controls system back to the engineer is mandatory.
3. Invitation to attend the training with the owners representative should be made to the engineer no less than 5 days prior to training
4. Signature confirmation of training and startup is required within 5 business days after completion back to the engineer's office.

M. All LED drivers should be capable of 0-10 volt controls and DMX control and shall dim to 1% of total lumen output. Where specifically specified the dimming driver may be required to dim to .1% of lumen output , otherwise known as "dim to dark"

N. Driver manufacturers must have a 5 year history producing dimmable electronic LED drivers for the North American market.

O. Ambient driver temperatures must be within -20 degrees to 50 degrees C (-4 degrees to 122 degrees F)

P. Driver (internal) must limit inrush current.

1. Base specification: meet or exceed NEMA 410 driver inrush standard of 430 amp per 10 amps load with a maximum of 370 amps/2 seconds
2. Preferred specification : Meet or exceed 30ma's at 277 VAC for up to 50 watts of load and 75A at 240us att 277 VAC for 100 watts of load
3. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A

4. No visible change in light output with a variation of plus/minus 10percent line voltage input.
5. Total harmonic distortion less than 20%, and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD

2.4 DOWNLIGHT

A. Universal mounting bracket.

B. Integral junction box with conduit fittings.

2.5 STRIP LIGHT

A. Integral junction box with conduit fittings.

2.6 SURFACE MOUNT, LINEAR

A. Universal mounting bracket.

B. Integral junction box with conduit fittings.

2.7 SURFACE MOUNT, NONLINEAR

A. Universal mounting bracket.

B. Integral junction box with conduit fittings.

2.8 SUSPENDED, LINEAR

A. Ceiling mounted with two 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.

2.9 SUSPENDED, NONLINEAR

A. Universal mounting bracket.

B. Integral junction box with conduit fittings.

2.10 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.

3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Tempered Fresnel glass, prismatic glass or prismatic acrylic, refer to light fixture schedule**.**
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink or as noted on light fixture schedule.
2. Powder-coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.11 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.12 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish shall match luminaire.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Remote Mounting of Driver: Distance between the driver and luminaire shall not exceed that recommended by manufacturer. Verify, with manufacturers, maximum distance between driver and luminaire.

C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

D. Install lamps in each luminaire.

E. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.

F. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

G. Ceiling-Grid-Mounted Luminaire Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inches from luminaire corners.
2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on luminaire. Wire or rod shall have breaking strength of the luminaire weight at a safety factor of 3.

H. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

I. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls, or a minimum 20 gauge backing plate attached to wall structural members, or using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

J. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and [tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

B. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

C. Luminaire will be considered defective if it does not pass operation tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265116

SECTION 265219 - EMERGENCY AND EXIT LIGHTING

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. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

a. Testing Agency Certified Data: For indicated luminaires and signs, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires and signs shall be certified by manufacturer.

b. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

D. Qualification Data: For testing laboratory providing photometric data for luminaires.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace (materials and labor) components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two year(s) from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Power Unit Batteries: **5** years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining four years.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

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. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.

G. Bulb Shape: Complying with ANSI C79.1.

H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.

1. Emergency Connection: Operate two lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.

2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
    b. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
    c. Humidity: More than 95 percent (condensing).
    d. Altitude: Exceeding 3300 feet.

4. Nightlight Connection: Operate lamp continuously at 40 percent of rated light output.
5. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

6. Battery: Sealed, maintenance-free, nickel-cadmium type.
7. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

I. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.

1. Emergency Connection: Operate fluorescent or LED lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Nightlight Connection: Operate lamp in a remote luminaire continuously.
4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type.
6. Housing: NEMA 250, Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly shall be located no less than half the distance recommended by the ballast/emergency power unit manufacturer, whichever is less.
7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

1. Emergency Luminaires: as indicated on Drawings, with the following additional features:
   a. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.

C. Emergency Lighting Unit:

1. Emergency Lighting Unit: as indicated on Drawings.
2. Wall with universal junction box adaptor.
3. UV stable thermoplastic housing, rated for damp locations.

D. Remote Emergency Lighting Units:

1. Emergency Lighting Unit: as indicated on Drawings.
2. Wall with universal junction box adaptor.
3. UV stable thermoplastic housing, rated for damp locations.
4. External emergency power unit.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.4 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.

2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:
1. Glass: Annealed crystal glass unless otherwise indicated.
2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:
1. Powder coat finish.

2.5 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, and 12 gage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls, or a minimum 20 gauge backing plate attached to wall structural members, or using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service:
   1. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

   1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.

      a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

   2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219

SECTION 265621 - EXTERIOR LIGHTING

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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
   2. Luminaire-mounted photoelectric relays.

B. Related Requirements:

   1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. Lumen: Measured output of lamp and luminaire, or both.

E. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

F. Pole: Luminaire support structure, including tower used for large-area illumination.

G. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of the luminaires.

4. Drivers including UL listing and recognition, ANSI certification, and Energy Independence and Security Act of 2007 compliance.
5. Lamps, including life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides," of each luminaire type. The adjustment factors shall be for lamps, drivers, and accessories identical to those indicated for the luminaire as applied in this Project.
   For LED luminaires the adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.

   a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
   b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

7. Photoelectric relays.
8. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Include diagrams for power, signal, and control wiring.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

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. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Drivers.
2. Lamp.
3. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Sample warranty.

1.6 PRIOR APPROVAL SUBMITTAL REQUESTS

A. Full submittal data, by type, clearly highlighted and arrowed to identify the specific proposed manufacturer's nomenclature

B. Full submittal data of lamp and proposed manufacturer.

C. Full submittal data of driver (LED) of proposed manufacturer

D. LED lumen data will include
1. Lumen output
2. L70 and L90 testing
3. Confirmation of independent test lab data ITL
4. Color temperature and CRI with quantity of McAdam Ellipse steps
   a. Data shall include sphere and goniometer results for total lumen, total power, luminaire efficacy, CRI and junction temperature for the specified color temperature
5. Make and brand of LED diode should be clearly identified on submittal data

E. LED dimming shall be equal in range and quality to the specified drivers, Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.

F. All substitutions must meet specified fixtures certifications (UL, ETL, CE, CSA, RoHS, DLC, Energy Star)

G. Provide lighting calculations with the prior approval request based on reflectance values and light loss factors provided by the engineer and displayed on lighting calculation drawings. (may be unique by area). Calculations shall be shown on one sheet with dimensions as shown on construction set. Data will be submitted electronically in dxf format on a flash drive and with printed calculations on Architectural E size sheets to scale with construction set sheets.

1. Discrepancies between prior approval data calculations and the original design calculations will result in immediate disqualification of review due to time-based constraints on the bid process.

H. Prior approval request may require a sample of both the proposed and specified fixtures provided by the alternate manufacturer at NO additional cost to the project. Samples of both specified and proposed must be provided within 10 working days of request.

I. All data will be submitted electronically and in a bound format.

J. Bound data will be secured in hard binder with 3” rings for ease of review or PDF file.

1. Types will be marked with a tab by type and indexed for ease of reference.

K. LED warranty information MUST be included by type and marked in RED to clearly identify the manufacturer’s warranty terms. Warranty data MUST meet or exceed the specified manufacturers terms.

L. Prior approvals MUST be received and acknowledged to the specifier’s office no less than 10 business days prior to bid.

M. ALL prior approval data must be submitted in one package with complete information. Information that is incomplete will be rejected without review.

N. The prior approval will be returned marked approved or rejected by type with no explanation. If any specification is deemed not equal the review will be stopped, the type rejected with no explanation.

O. Lumen output for the proposed fixture must be highlighted in yellow for clear identification.

P. All inverter systems supply power to LED fixtures must have pure PWM sine wave function and work with any type of lighting load.

Q. LED warranty information must be included by type and marked in red to clearly identify the manufacturer’s warranty terms. Warranty data must meet or exceed the specified manufacturers terms.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in [**operation**] and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.8 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. Glass, Acrylic, and Plastic Lenses Covers and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.9 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.11 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.12 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace (labor and material) components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including luminaire support components.
    b. Faulty operation of luminaires, driverss, and accessories.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

A. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

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. NRTL Compliance: Luminaires shall comply with UL 1598 and be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Lateral Light Distribution Patterns: Comply with IES RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

E. UL Compliance: Listed for wet location (UL 1598).

F. Lamp base complying with ANSI C81.61 or IEC 60061-1.

G. EMI Filters: Factory installed to suppress conducted EMI as required by MIL-STD-461E. Fabricate luminaires with one filter on each drover indicated to require a filter.

H. In-line Fusing: Install on the driver primary for each luminaire.

I. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

J. Source Limitations: Obtain luminaires from single source from a single manufacturer.

K. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LED LIGHTING FIXTURES AND LED LAMPS

A. All LED products must be UL, ETL and/or CSA listed

B. All LED products must have LM-79 and LM-80 testing noted on specification sheet by an independent test lab

C. All LED products should be identified as L70 and/or L90 ratings based on independent test lab data

D. All outdoor and wet location listed products must clearly state the IP rating carried on the fixture based on independent test lab data

E. Bulb shape complying with ANSI C79.1.

F. CRI of Minimum 80. CCT of 4100 K.

G. Rated lamp life of **50,000** hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Nominal Operating Voltage: as noted on light fixture schedule.

J. All LED products must be serviceable for accessible for field repair needs.

K. All outdoor pole mounted products must have surge suppression within each fixture.

L. All outdoor lighting color rendering should be within a 7 step McAdams Ellipse. All outdoor lighting should be 4000 kelvin unless specifically noted

M. All control systems that interface with an LED product will be supported by a project "integrator" until project completion. This includes contact with the installer prior to installation, availability during installation, and final checkout and startup after installation. The quantity of days required for startup will be based on the manufacturer/agents discretion and need.

1. The project integrator must be capable of performing low voltage and dmx terminations. High voltage terminations are performed solely by the electrical subcontractor.
2. Reporting of final startup completion of the controls system back to the engineer is mandatory.
3. Invitation to attend the training with the owners representative should be made to the engineer no less than 5 days prior to training
4. Signature confirmation of training and startup is required within 5 business days after completion back to the engineer's office.

N. All LED drivers should be capable of 0-10 volt controls and DMX control and shall dim to 1% of total lumen output. Where specifically specified the dimming driver may be required to dim to .1% of lumen output , otherwise known as "dim to dark"

O. Driver manufacturers must have a 5 year history producing dimmable electronic LED drivers for the North American market.

P. Ambient driver temperatures must be within -20 degrees to 50 degrees C (-4 degrees to 122 degrees F)

Q. Driver (internal) must limit inrush current.

1. Base specification: meet or exceed NEMA 410 driver inrush standard of 430 amps per 10 amps load with a maximum of 370 amps/2 seconds
2. Preferred specification: Meet or exceed 30ma's at 277 VAC for up to 50 watts of load and 75A at 240us att 277 VAC for 100 watts of load
3. Withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A
4. No visible change in light output with a variation of plus/minus 10percent line voltage input.
5. Total harmonic distortion less than 20% and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 LUMINAIRE TYPES - See light fixture schedule on plans.

2.5 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum or Stainless steel unless otherwise indicated. Form and support to prevent warping and sagging.

C. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Driver shall automatically disconnect when door opens.

E. Exposed Hardware Material: Stainless steel.

F. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

H. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

J. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY," including specific lamp type.
b. Lamp type, wattage, bulb type, and coating (clear or coated) for HID luminaires.
c. CCT and CRI for all luminaires.

2.6 METAL FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker), complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Remote Mounting of Drivers: Distance between the driver and luminaire shall not exceed that recommended by manufacturer. Verify the following with manufacturer:

1. Maximum distance between driver and luminaire.
2. Wire size between driver and luminaire.

E. Wiring Method: Install cables in raceways. Conceal raceway and cables.

F. Fasten luminaire to indicated structural supports.

G. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

H. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls, or a minimum 1/8-inch backing plate attached to wall structural members or using through bolts and backing plates on either side of wall.

I. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height indicated on Drawings.

J. Coordinate layout and installation of luminaires with other construction. Refer to architectural elevations prior to rough-ins.

K. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

L. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems;" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Photoelectric Control Operation: Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.8 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265621

SECTION 267210 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Modify/Expand/Upgrade existing addressable control panel, manual and automatic initiation devices and associated raceways and power connection for power supplies for a complete installation. Indicating devices shall also be provided to comply with TDLR.

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 – No substitutions.

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 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.
3. Provide all manual stations with STI 1100 protective cover.

2.3 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. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

C. 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.

D. Single-Station Duct Detectors:

1. UL 268A listed, operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.

    a. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

3. 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.
4. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.

5. Integral Visual-Indicating Light: LED type. Indicating detector has operated status. Provide remote status and alarm indicator and test station where indicated.
6. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
7. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.4 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.5 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

2. All appliances that are supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "equivalent facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADAAG)), and shall be UL 1971 Listed.

3. All appliances shall be of the same manufacturer as the fire alarm control panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions.

4. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended. All strobes shall be provided with lens markings oriented for wall mounting.

5. Notification appliances shall be synchronized in hallways and in any area where two more appliances are visible.

6. All notification appliances shall be white unless noted otherwise on the drawings.

B. Low Profile Horns: Provide low profile wall mount horns at the locations shown on the drawings. The horn shall provide an 84-dBA sound output at 10 ft. when measured in reverberation room per UL-464. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. The horn shall mount in a North American 1-gang box.

C. Low Profile Strobes Horns: Provide low profile wall mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low profile horn/strobes shall mount in a North American 1-gang box.

D. Low profile strobes: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output: 75 110 candela or as noted on plans.
2. Strobe Leads: Factory connected to screw terminals.

2.6 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.

D. Underground cabling: Please provide water resistant/water blocking type, equal to West Penn “Aquaseal”.

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. Smoke or Heat Detector Spacing:

1. Smooth ceiling spacing shall not exceed the rating of the detector.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

C. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

E. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

F. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install not less than 80 inches above the finished floor nor less than 6 inches below the ceiling whichever is lower.

H. Visual Alarm-Indicating Devices: Install as shown and not less than 80 inches above the finished floor or 6 inches below the ceiling whichever is lower.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

J. FACP: Flush mount with tops of cabinets not more than 72 inches above the finished floor.

K. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

L. Manual Pull Stations: Mount semi-flush in recessed back boxes with operating handles 48 inches above finished floor or as indicated.

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 MONITORING

A. Include in bid proposal the cost for 1 year remote monitoring. Monitoring station shall UL listed and 24 hour 365 days operation.

3.7 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.

3.8 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

SECTION 267230 – SCHOOL INTERCOM AND PROGRAM EQUIPMENT

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 direct-connected, manually switched, school intercom and program equipment independent of telephone equipment.

B. Provide conduit, wire, and outlets; splice boxes as shown on plans and as herein specified to expand/provide a complete Sound and Voice Communication Systems.

1.3 PERFORMANCE REQUIREMENTS

A. Handset Station: Capable of the following functions:

1. Having privacy from remote monitoring without a warning tone signal at monitored station.
2. Returning a busy signal to indicate station is already in use.

B. Speakers: Free from noise and distortion during operation and when in standby mode.

1.4 SUBMITTALS

A. Product Data: For each component.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection.

1. Station-Arrangement Details: Scaled drawings for built-in equipment.
2. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include a single-line diagram showing cabling interconnection of components.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

D. Maintenance Data: For equipment to include in maintenance manuals specified in Division 1.

1. Include record of Owners equipment-programming option decisions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications
   1. An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. It 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. A minimum of two technicians shall be Factory Trained for the submitted product(s). Technicians shall be full time employees of the Contractor. Factory Certifications shall be included in the submittals.

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.

C. Comply with NFPA 70.

D. Comply with UL 50.

1.6 OCCUPANCY ADJUSTMENTS

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions. Provide up to three on-site assistance visits within one year of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. CareHawk – No Substitutions.

2.2 EQUIPMENT AND MATERIALS

A. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Expansion Capability: Increase number of stations in the future by 25 percent above those indicated without adding any internal or external components or main trunk cable conductors. Up to 360 stations.

C. Equipment: Modular type using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

1. Waterproof Equipment: Listed and labeled for duty outdoors or in damp locations.

2.3 ALL-CALL AMPLIFIER

A. Comply with EIA SE-101-A.

B. Minimum Output Power: 1 W, RMS for each station and speaker that can be connected in all-call mode of operation, plus an allowance for future stations.

C. Total Harmonic Distortion: Less than 5 percent at rated output power with a load equivalent to quantity of stations connected in all-call mode of operation.

D. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.

E. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.

F. Output Regulation: Maintains output level within 2 dB from full to no load.

G. Input Sensitivity: Compatible with master stations and central equipment so amplifier delivers full-rated output with a sound-pressure level of less than 10 dynes/sq. cm impinging on a master station, speaker microphone, or handset transmitter.

H. Amplifier Protection: Prevents damage from shorted or open output.

2.4 INTERCOM AMPLIFIERS

A. Comply with EIA SE-101-A.

B. Minimum Output Power: 15 W and adequate for all functions.

C. Total Harmonic Distortion: Less than 5 percent at rated output power with a load equivalent to one station connected to output terminals.

D. Minimum Signal-to-Noise Ratio: 50 dB, at rated output.

E. Frequency Response: Within plus or minus 3 dB from 70 to 10,000 Hz.

F. Output Regulation: Maintains output level within 2 dB from full to no load.

G. Input Sensitivity: Matched to input circuit and providing full-rated output with a sound-pressure level of not more than 10 dynes/sq. cm impinging on microphones in master stations, speaker microphones, and handset transmitters.

H. Amplifier Protection: Prevents damage from shorted or open output.

I. Model #: Valcom VENRK

2.5 CONE-TYPE LOUDSPEAKERS

A. Comply with EIA SE-103.

B. Minimum Axial Sensitivity: EIA pressure rating of 45 dB.

C. Frequency Response: Within plus or minus 3 dB from 70 to 17,000 Hz.

D. Power rating: 5 watts continuous

E. Minimum Dispersion Angle: 100 degrees.

F. Line Transformer: Comply with EIA-160, maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.

G. Enclosures: Steel housings or back boxes, acoustically dampened, with front face of at least 0.0478-inch steel and whole assembly rust proofed and factory primed; suitable for surface ceiling, flush ceiling, pendant or wall mounting; and with relief of back pressure.

H. 24”X24” lay-in type with scuff resistant perforated grille and integral back box, white finish.

I. Size: 8 inches with 1-inch voice coil and minimum 5-oz ceramic magnet.

J. Model #: Quam System 12

2.6 HORN-TYPE LOUDSPEAKERS

A. Comply with EIA SE-101-A. All-metal, weatherproof construction.

B. Frequency Response: 275HZ to 14,000 Hz.

C. Minimum Power Rating of Driver: 15 W, continuous.

D. Minimum Dispersion Angle: 110 degrees.

E. Line Transformer: Comply with EIA-160, maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four volume taps.

F. Atlas VT series or equal.

2.7 CONDUCTORS AND CABLES

A. Conductors: category 3/5.

B. Insulation: Thermoplastic, not less than 1/32 inch.

C. Plenum Cable: Listed and labeled for plenum use.

D. Underground cabling: Please provide water resistant/water blocking type, equal to West Penn “Aquaseal”.

2.8 EQUIPMENT FRAMES

A. General Frame Requirements:

1. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Manufacturer: APC

B. Modular Freestanding Cabinets:

1. Removable and lockable side panels.
2. Hinged and lockable front and rear doors.
3. Adjustable feet for leveling.
4. Screened ventilation openings in the roof and rear door.
5. Cable access provisions in the roof and base.
6. Grounding bus bar.
7. Power strip.
8. Baked-polyester powder coat finish.
9. All cabinets keyed alike.

C. Modular Wall Cabinets:

1. Wall mounting.
2. Aluminum construction.
3. Treated to resist corrosion.
4. Lockable front and rear doors.
5. Louvered side panels.
6. Cable access provisions top and bottom.
7. Grounding lug.
8. Power strip.
9. All cabinets keyed alike.

D. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.9 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Rack mounting.
3. Six 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.
6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
7. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
8. Cord connected with 15-foot line cord.
9. Rocker-type on-off switch, illuminated when in on position.
10. Peak Single-Impulse Surge Current Rating: 33kA per phase.
11. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.
12. Manufacturer: APC

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment to comply with manufacturer's written instructions.

B. Wiring Method: Install wiring in raceway (concealed inside walls, above inaccessible ceilings and below floor). When above accessible ceiling install on cable tray (if available) and or parallel and or perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables by straps, staples, or similar fittings so designed and installed to avoid damage to cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, or fittings. Use plenum cable in environmental air spaces, including plenum ceilings. Raceways shall comply with Division 16. Inside existing office building provide one piece metal surface raceway (below ceiling).

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

D. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

E. Separation of Wires: Separate speaker, microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches for speakers and adjacent parallel power and telephone wiring. Separate other school intercom and program equipment conductors as recommended by equipment manufacturer.

F. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

G. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

H. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.

3.2 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Division 16 Section "Grounding."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installations, including connections. Report results in writing.

B. Programming: Fully brief Owner on available programming options. Record Owners decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

C. Operational Test: Test originating station-to-station, all-call, and page messages at each intercom station. Verify proper routing and volume levels and freedom from noise and distortion. Test each available message path from each station on system.

D. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use a sound-level meter with octave-band filters to measure level at five locations in each paging zone. Maximum permissible variation in level is plus or minus 3 dB, and in levels between adjacent zones are plus or minus 5 dB.

E. Power Output Test: Measure electrical power output of each paging amplifier at normal gain setting at 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.

F. Retesting: Correct deficiencies and retest. Prepare written record of tests.

G. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging and independent room speaker-line matching transformers.

H. Schedule tests with at least seven days advance notice of test performance.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment as specified below:

1. Train Owners maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.
2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 267230

SECTION 267240 - INTRUSION DETECTION

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:

1. This document is intended to specify the requirements for the provision of all equipment, materials, labor, documentation and services necessary to furnish and install a complete and operational integrated security access control and alarm monitoring (ACAM) system. The system shall consist of a fully automated and integrated computer-based security system, including, but not limited to the following functions and capabilities:

a. Security alarm monitoring and reporting of alarm and trouble conditions detected by sensors and/or devices in local and remote locations
b. Expand existing control panel to accommodate new building addition intrusion devices and sub-panel.

1.3 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. PIR: Passive infrared.

D. RFI: Radio-frequency interference.

E. UPS: Uninterruptible power supply.

F. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

1.4 SUBMITTALS

A. Product Data: Components for sensing, detecting**,** and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate control, signal, and data communication paths. \
2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type, and size, and type and size of wire and cable fill for each raceway run.
3. Device Address List: Coordinate with final system programming.
4. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
5. Details of surge-protection devices and their installation.
6. Sensor detection patterns and adjustment ranges.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Data for each type of product, including features and operating sequences, both automatic and manual.

E. Warranty: Special warranty specified in this Section.

F. Other Information Submittals:

1. Test Plan and Schedule: Test plan defining all tests required to ensure that system meets technical, operational, and performance specifications.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier who has completed systems integration work for installations 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.

C. FMG Compliance: FMG-approved and -labeled intrusion detection devices and equipment.

D. Comply with NFPA 70.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace (labor and materials) components of intrusion detection devices and equipment that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.7 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. Intrusion Detection Devices: Furnish quantity equal to two percent of the number of units of each type installed, but no less than one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

a. Existing Bosh 5512 – No substitutions.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Supervision: System components shall be continuously monitored for normal, alarm, supervisory**,** and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.

1. Alarm Signal: Display at central-station control unit and actuate audible and visual alarm devices.
2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or controller failure.
3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or controller.

B. System Control: Central-station control unit shall directly monitor intrusion detection units and connecting wiring.

C. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.

D. Operator Commands:
1. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
2. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
3. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
4. Protected Zone Test: Initiate operational test of a specific protected zone.
5. System Test: Initiate system-wide operational test.

E. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from central-station control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at central-station control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.

F. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.

2.3 SYSTEM COMPONENT REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.

1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.

B. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHz.

C. Tamper Protection: Tamper switches on detection devices, controllers, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected.

D. Manufacturers:

1. Bosh – no substitutions

2.4 DOOR AND WINDOW SWITCHES

A. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of two encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.

B. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.

C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-

mounting magnet and floor-mounting switch unit.

PART 3 - EXECUTION

3.1 SYSTEM INSTALLATION

A. Comply with UL 681.

3.2 WIRING INSTALLATION

A. Installation: UL 681.

B. Wiring Method: Install wiring in raceways except in accessible indoor ceiling spaces. Secure from building structure steel (no from walls) by means of J-hooks. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Where available lay out cables in cable tray.

D. Wiring shall not be exposed below ceiling.

E. Raceway system shall comply with Section 16130.

F. Each security device is to have an individual cable from the device to the Control Panel.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

H. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.
2. 120-V Power Wiring: Install according to Division 16 Section "Conductors and Cables," unless otherwise indicated.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable, unless otherwise indicated or if manufacturer recommends shielded cable.
4. Provide rated for return open plenum.
5. Underground cabling: Please provide water resistant/water blocking type, equal to West Penn “Aquaseal”.

I. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

J. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

K. Identify components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 16 Section "Electrical Identification."

3.3 ZONES

A. Each building area shall be zoned by occupancy areas (office area, kitchen, science lab, computer lab, first floor classrooms, second floor classrooms) and interior and exterior zones

3.4 GROUNDING

A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

C. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Division 16 Section "Grounding and Bonding."

3.5 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Perform the following field tests and inspections and prepare reports:

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.

C. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.

D. Tag all equipment, stations, and other components for which tests have been satisfactorily

completed.

3.6 MONITORING

A. Include in bid proposal the cost for 1-year remote monitoring. Monitoring station shall UL listed and 24 hours 365 days operation.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain intrusion detection. Refer to Division 1 Section "Demonstration and Training."

B. Train Owners maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment. Provide a minimum of two 2 hours training.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

END OF SECTION 267240

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GROUND WATER HANDLING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.

B. Protecting work against surface runoff and rising flood waters.

C. Disposing of removed water.

1.02 REFERENCES:

A. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

B. Federal Register 4O CFR (Vol. 53. No. 222) Part 122, EPA Administrator permit Programs (NPDES), Pam 122.26 (b) (l4) Storm Water Discharge.

1.03 DEFINITIONS:

A. Ground water control includes both dewatering and depressurization of water-bearing soil layers using well points, for either vacuum or educator systems, or deep wells. Use of sump pumps does not constitute ground water control.

1. Dewatering is lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations or into tunnels and shafts, and disposing of removed water.

2. Depressurization is reduction of piezometric pressure within a soil strata not controlled by dewatering alone.

B. Control of excavation drainage by sump pumping includes operating the sump pump and drainage facilities installed to collect water in the sump.

C. Control of surface drainage is diversion of surface water away from excavations.

1.04 PERFORMANCE REQUIREMENTS:

A. Conduct subsurface investigations as needed to identify ground water conditions and to provide parameters for installation and operation of ground water control systems. Perform pump tests, if necessary, to determine drawdown characteristics of water bearing layers.

B. Develop a ground water control system, compatible with requirements of Federal Regulations 29 CER Part 1926, to produce the following results:

1. Reduce hydrostatic pressure affecting excavations to the following levels as determined by piezometer observations.

    a. For structural excavations, reduce the piezometric level to at least 3 feet below the excavation bottom elevation or within 2 feet above the top of clay layers.

    b Where hydrostatic pressure in a confined water-bearing layer exist below the excavation, depressurize this zone to eliminate risk of uplift or other instability of the excavation or installed works.

2. Develop stable subgrade for subsequent construction operations.

3. Reduce hydrostatic pressure for tunnel excavations as necessary to maintain face stability, grade control, and to control seepage into tunnel

C. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials such as crushed stone and filter fabric, together with sump pumping

D. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells

E. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, if they affect potentially contaminated areas

1.05 SUBMITTALS:

A. Contractor to submit a Dewatering Plan to include: list of equipment to be used, pump capacity, length of dewatering operations to be in effect at any time, identification of point(s) of discharge, identification of location(s) of turbidity control measures.

1.06 ENVIRONMENTAL REQUIREMENTS:

A. Comply with the Texas Commission on Environmental Quality regulations and Texas Water Well Driller Association for development, drilling, and abandonment of wells used in dewatering system.

B. Where potentially contaminated areas are indicated on the Drawings, monitor ground water discharge for contamination in accordance with the Project Engineer’s instructions.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Equipment and materials are at the option of Contractor as necessary to achieve desired results for ground water control. Ground water control systems may include single-stage or multiple-stage well point systems, educator and ejector-type systems, deep wells, or combinations of these equipment types. Excavation drainage and surface drainage may also include sump pumping subsidiary to bid item.

B. Maintain equipment in good repair and operating order.
C. Arrange for standby equipment and materials where required.

PART 3 - EXECUTION

3.01 GROUND WATER CONTROL

A. Install, operate and maintain the ground water control system in a manner compatible with construction methods and site conditions. Notify Project Engineer in writing of any changes made to accommodate field conditions and changes to the Work.

B. For above ground piping in ground water control system, include a length of clear transparent piping between every well point and discharge header so that discharge from each installation can be visually monitored.

C. Replace installations that produce noticeable amounts of sediments after development.

D. Provide additional ground water control installations, or change the methods, if the installation does not achieve satisfactory results.

E. Do not allow piezometric pressure levels to rise until foundation concrete has achieved design strength.

F. During backfilling, dewatering may be reduced to maintain water level a minimum of 2 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place.

G. Remove ground water control installations.

1. Remove pumping system components and piping when ground water control is no longer required.
2. Remove monitoring wells when directed by the Project Engineer.

3. Grout abandoned well. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

3.02 MAINTENANCE AND OBSERVATION

A. Conduct daily maintenance and observation of the ground water control systems.

B. Replace inoperable or damaged system components as necessary to maintain operation.

C. Keep monitoring system piping accessible for observation,

3.03 MONITORING AND RECORDING

A. Observe and record elevation of water level daily as long as ground water control system is in operation. Observe levels weekly thereafter until the Work is completed or piezometers or wells are removed. Initiate more frequent observation when the Project Engineer determines that more frequent monitoring and recording are required.

3.04 SURFACE WATER CONTROL

A. Intercept surface water and divert it away from excavations. This includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

B. Drive surface water and seepage water into sumps and pump it into drainage channels, setting basins, or storm drains,

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

The work as provided for by this specification shall be measured as lump sum or as noted on the bid request. When not line item is included in the Bid Proposal, this work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

4.02 PAYMENT

When shown as a specific line item in the proposal, the work as prescribed for in this specification shall include all labor, tools, equipment, over-excavation, trench bedding, backfilling, materials, and incidentals necessary to complete the work.

END OF SECTION

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EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 - GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.

The intent of this specification is to provide guidelines for the Contractor to adhere to all State, Federal, and Local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system, including open channels. It is the Contractor's responsibility to adhere to all State, Federal and Local requirements. While the Owner may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.02 QUALITY ASSURANCE

A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.

B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner or the Engineer.

C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the time of exposure.

D. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment loss during the period of exposure.

E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving ditch or stream, the Contractor shall install measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream as directed by the Owner or the Engineer.

F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation damage.

C. The Contractor shall be responsible for periodically cleaning out and disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. The Contractor shall also be responsible for cleaning out and disposing of all sediment at the time of completion of the Work.

1.03 SUBMITTALS

Submittals shall be in accordance with Section 01300, SUBMITTALS, and shall include:

A. Manufacturer's Literature: Descriptive data of installation methods and procedures.

B. Certificates: Manufacturer's certification that materials meet specification requirements.

1.04 JOB CONDITIONS AND ORDINANCES

Comply with the local ordinances. If local ordinances require *more* stringent or additional erosion and sediment control measures during construction, Contractor shall provide such measures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. STRAW BALES: Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least 30" in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string. Jute or cotton binding is unacceptable. Bales shall be used for not more than three months before being replaced. However, if weather conditions cause biological degradation of the straw bales, they shall be replaced sooner than the three month time period to prevent a loss of structural integrity of the dike.

B. SILT FENCE: Silt fence fabric shall be a nylon reinforced polypropylene fabric which has a built-in cord running the entire length of the top edge of the fabric. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632		90 lbs.
Puncture Rating, ASTM D4833		60 lbs.
Mullen Burst Rating, ASTM D3786		200 psi.
Apparent Opening Size, U.S. Sieve No.	40	

Silt fence shall be "Enviro Fence" preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

C. SILT FENCE POSTS: A minimum 2" x 2" (nominal) x 54" pressure treated wood posts of Number 2 Grade southern yellow pine or approved equal.

D. SAND BAG: Sand bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%. Length shall be 24 to 30 inches, width shall be l6 to 18 inches and thickness shall be six (6) to eight (8) inches and having an approximate weight of 40 pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.

E. P.V.C. PIPE: Pipe shall be SDR-35 polyvinyl chloride having a minimum nominal internal diameter of 4". Pipes shall be sized for anticipated flows.

F. SOIL RETENTION BLANKET: Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net attached to the top side. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant

without the use of chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. The soil retention blanket shall be one (1) of the following classes and types:

1. Class 1. "Slope Protection"

   (a) Type A. Slopes of 3:1 or flatter-Clay soils

   (b) Type B. Slopes of 3:1 or flatter - Sandy soils

   (c) Type C. Slopes steeper than 3:1 - Clay soils

   (d) Type D. Slopes steeper than 3:1 - Sandy soils

2. Class 2. "Flexible Channel Liner"

   (a) Type E. Short-term duration (Up to 2 Years)
   Shear Stress (t_d) <1.0 lb./sq. ft.

   (b) Type F. Short-term duration (Up to 2 Years)
   Shear Stress (t_d) 1.0 to 2.0 lb./sq. ft.

   (c) Type C. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d)> 2.0 to < 5.0 lb./sq. ft.

   (d) Type H. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d) greater than 0 Equal to 5.0 lb/sq. ft.

The Contractor has the option of selecting an approved soil retention blanket provided that selection conforms to the following list of approved soil retention blankets for slope protection applications:

CLASS I. SLOPE PROTECTION

TYPE A: Slopes of 3: I or Flatter- Clay Soils

Airtrol® ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards®
Contech Standards Plus®
Green Triangle Regular®
Green Triangle Superior®
GREENSTREAK® PEC MAT
Curlex®
North American Green® S150
North American Green® S75
North American Green® SC 150
POLYJUTEÔ 4O7/GT
SOIL SAVER®
TerraJute®
Verdyol® ERO-MAT®
Xcel Regular®
Xcel Superior®

TYPE B: Slopes of 3:1 or Flatter-Sandy Soils

Contech Standards®
Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
Green Triangle Regular®
North American Green® 575
North American Green® SC 150
North American Green® S150
POLYJUTEO 407/CT
TerraJute®
Verdyol® ERO-MAT®
Xcel Superior®
Xcel Regular®

TYPE C: Slopes Steeper than 3:1-Clay Soils

Airtrol®
ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards Plus®
Curlex®
Green Triangle Superior®
GREENSTREAK® PEC-MAT
North American Green® SC 150
North American Green® S150
POLYJUTEÔ 407/CT
SOIL SAVER®
TerraJute®
Xcel Superior®

TYPE D: Slopes Steeper than 3:1-Sandy Soils

Contech Standards Plus®
GEOCOIR®/DEKOWE®700
Green Triangle Superior®
North American Green®S150
North American Green®SC150
POLYJUTEÔ 407GT
TerraJute®
Xcel Superior®

CLASS II: FLEXIBLE CHANNEL LINER PROTECTION

PART 3 - EXECUTION

3.01 PREPARATION

A. Contractor shall prepare the site for installation of the erosion and sediment control devices in accordance with the manufacturer's recommendations when applicable. At all times, CONTRACTOR, shall take extreme care during the installation of the applicable devices to minimize disturbance of the project site.

3.02 INSTALLATION

A. TEMPORARY STRAW BALE DIKE

1. Straw bales shall be embedded a minimum of 4” and securely anchored using 2” x 2” wood stakes driven through the bales into the ground a minimum of 6” Straw bales are to be placed directly adjacent to one another leaving no gap between them.

2. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale. Additional bales shall be placed behind the first row where the bales abut each other. The additional bale is used to prevent unfiltered runoff from escaping between the bales.

3. The-excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4” above ground level on the uphill side. Loose straw shall be scattered over the area immediately uphill from a straw barrier.

B. SILT FENCE

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. The Contractor shall excavate a 6 inch wide by 6 inch deep trench for site fence bedding along the lower perimeters of the site where necessary to prevent sediment from entering any drainage system. The Contractor shall install the silt fence in accordance with the manufacturer’s recommendations and instructions. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6” or installation of support post to depth of 12”. Fabric shall overlap at abutting ends a minimum of 3’ and shall be jointed such that no leakage or bypass occurs. If concentrated flow occurs after installation, corrective action must be taken such as placing rock berm in the areas of concentrated flow.

C. SAND BAG BERM

1. The purpose of a sandbag berm is to intercept sediment-laden water from disturbed areas such as construction in steam beds, create a retention pond, detain sediment and release water in sheet flow.

2. A temporary sand bag berm shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5 acres. The berm shall be a minimum height of 18”, measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized to have a minimum width of 48” measured at the bottom of the berm and 18” measured at the top of the berm.

3. The sand bag berm shall be inspected after each rain. The sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the responsible party and when the silt reaches 6”, the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional

siltation. The sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand.

D. SOIL RETENTION BLANKETS

1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Soil retention blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Blankets are used in areas which are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.

2. The soil retention blanket, whether installed as slope protection or as flexible channel liner, shall be placed within 24 hours after seeding or sodding operations have been completed, or as approved by the Engineer. Prior to placing the blanket, the area to be covered shall be relatively free of all rocks or clods over 1-1/2" in maximum dimension and all sticks or other foreign material which will prevent the close contact of the blanket with the soil. The area shall be smooth and free of ruts and other depressions. If as a result of rain, the prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, the Contractor shall be required to rework the soil until it is smooth and to reseed or resod the area at the Contractor's expense.

3. Installation and anchorage of the soil retention blanket shall be in accordance with the manufacturer's recommendations.

E. PROTECTION OF BARE AREAS

1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than *5%* or which will be exposed for more than 30 days.

2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets, as determined by the Engineer, such as areas under proposed building slabs, shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "track walked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks,

3. Route runoff from the areas through the appropriate silt fence system.

4. Protect earth spoil areas by "trackwalking" and silt fences.

F. INTERCEPTOR SWALE

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales should remain in place until the disturbed area is permanently stabilized.

2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6 feet per second and shall consist of a layer of crushed stone *3"* thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 6 inches above the design water surface elevation based on a two year storm.

3. An interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five *(5)* acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3 :1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 3%, or velocities exceed 4 feet per second (regardless of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.

4. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.

5. The swale shall be excavated or shaped to line, grade, and cross-section as required to meet criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.

6. All earth removed and not needed in construction shall be disposed of in an approved spoils site so that it will be conveyed to a sediment trapping device.

7. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device.

8. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

9. Minimum compaction for the swale shall be 90% standard proctor.

G. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. Each silt fence installation shall have a minimum net length (exclusive of embedments into diversion dikes or other ineffective areas) of 25 feet. The runoff from a maximum of one (1) acre of disturbed area or soil stockpile/ spoil area shall be routed through any individual silt fence installation.

2. Install diversion dikes to divert runoff to the silt fence installation.

3. Install silt traps at the inlet (upstream) end of the drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.

4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor from time to time to effectively control erosion and sediment during construction.

3.03 MAINTENANCE

A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas or return the material to the area from which it eroded.

B. Upon completion of construction, properly remove the temporary erosion and sediment control structures and complete the area as indicated.

C. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.04 FIELD QUALITY CONTROL

In the event of conflict between the requirements and storm water pollution control laws, rules or regulations or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

The work as provided for by this specification shall be measured as lump sum or as noted on the bid request. When not line item is included in the Bid Proposal, this work shall be considered incidental to the completion of the project and no additional compensation shall be paid for this work.

4.02 PAYMENT

When shown in the proposal, the work as prescribed for in this specification shall be paid for labor, tools, equipment, excavation, backfilling, materials, and incidentals necessary to complete the work.

END OF SECTION

32 11 13

SUBGRADE PREPARATION

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This work shall consist of scarifying, blading and rolling the sub-grade to obtain a uniform texture and provide as nearly as practical a uniform density for the 6 inches of the sub-grade.

PART 2 - EXECUTION

3.01 CONSTRUCTION METHODS

A. All preparing of the right-of-way and/or clearing and grubbing shall be completed before starting the sub-grade preparation.

B. The sub-grade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated or as established by the ENGINEER by the removal of existing material or addition of approved material.

C. All unsuitable material shall be removed and replaced with approved material.

D. All foundations, walls or other objectionable material shall be removed to a minimum depth of 18-inches under all structures and 12-inches under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material.

E. The surface of the sub-grade shall be finished to the lines and grades as established and be in conformity with the typical sections indicated.

F. Any deviation in excess of ½ inch cross section and in a length of 10 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and compacting by sprinkling and rolling.

G. Sufficient sub-grade shall be prepared in advance to insure satisfactory prosecution of the work.

H. The CONTRACTOR will be required to set blue tops for the sub-grade on centerline, at quarter points and curb lines or edge of pavement at intervals not exceeding 50 feet.

I. All suitable material removed may be utilized in the sub-grade with the approval of the ENGINEER. All other material required for completion of the sub-grade shall also be subject to approval by the ENGINEER.

J. Sub-grade materials on which structures shall be placed shall be compacted by approved mechanical tamping equipment to a dry density of the total material of not less than 95 percent nor more than 100 percent of the maximum dry density as determined in accordance with SDHPT Test Method Tex-114-E.

K. Sub-grade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the maximum dry density as determined in accordance with SDHPT Test Method Tex-114-E.

L. Tests for density will be made as soon as possible after compacting operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.

M. Just prior to placing any base materials, density and moisture content of the top 6 inches of compacted sub-grade shall be checked and if tests show the density to be more than 2 percent below the specified minimum or the moisture content to be more than 3 percent above or below the optimum, the sub-grade shall be reworked as necessary to obtain the specified compaction and moisture content.

N. Proof Rolling is require before placing base material in conformity with Item 02686 “Proof Rolling”

N. When lime stabilization of the sub-grade is specified, the lime is to be added in accordance with Section 02240, Lime Stabilization.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. All acceptable sub-grade preparation will be measured by the square yard.

B. The measured area includes the entire width of the roadway for the entire length as indicated.

4.02 PAYMENT

A. The accepted quantities of sub-grade preparation will be paid for at contract unit bid price per square yard.

B. When not listed as a separate contract pay item, sub-grade preparation shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

32 11 13.1

LIME STABILIZATION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. Treating of subgrade, subbase, and base courses by the pulverization, addition of lime, mixing and compacting the mixed material to the required density.

B. Application to natural ground, embankment, existing pavement, base or subbase under this contract, or as directed by the ENGINEER, which shall be constructed as specified herein and in conformity with the typical section, lines, grades as shown on the plans.

1.02 QUALITY ASSURANCE

A. Comply with the latest published edition (or addended portions thereof) of the following standards and codes:

1. ASTM C—207 or Type N — Requirements for Hydrated Lime
2. ASTM Designation C5 — Quick Lime for Structural Purposes
3. Texas SDHPT Test Method Tex—600—J - Hydrated Lime
4. ASTM D—1557 - Density of Compacted Materials
5. ASTM D-2049 - Density of Compacted Materials
6. Texas SDI-IPT Test Method Tex 113—E — Density of Compacted Materials
7. AASHTO T—99, Method C - Density of Compacted Materials
8. AASHTO M-216 - Hydrated Lime

PART 2 - PRODUCTS

2.01 HYDRATED (DRY) LIME

A. Use, for stabilization of soils, a dry powder consisting primarily of calcium hydroxide ($Ca(OH)_2$).

B. Provide Material in accordance with Texas SDHPT Test Method TEX— 600—J and conforming to the following chemical composition:

Hydrate Alkalinity, Percent by Weight $Ca(OH)_2$ 90% Min. Unhydrate Lime Content, Percent by Weight CaO 5% Max. “Free Water” Content, Percent by Weight H_20 4% Max.

And with the following residue retainage:

Residue Retained on No. 6 Sieve	None
Residue Retained on No. 10 Sieve	1% Max.
Residue Retained on No. 30 Sieve	2.5% Max.

C. Store and handle hydrated lime in closed, weather proof containers, storage bins, or bags until immediately before application to the road.

D. Furnish hydrated lime in trucks, as applicable, with weight of lime measured on certified scales and clearly marked on the truck or stamped on a haul ticket.

E. Furnish hydrated lime in bags, as applicable, bearing the manufacturer's certified weight. Bags varying more than five percent may be rejected.

2.02 HYDRATED LIME SLURRY

A. Provide a pumpable suspension of solids, principally composed of hydrated lime, in water.

B. Provide material with a "Solids Content" having a hydrated alkalinity $Ca(OH)_2$ of not less than 90 percent by weight and a residue retainage equal to the retainage specified in Part 2.01B above.

C. Supply Type B, commercial lime slurry, with a "dry solids content" of at least 31% by weight of the slurry (Grade 1).

D. Procure mixing water only from water mains. The Contractor shall make arrangements with the City Water Department to obtain a meter and subsequent payment for water used.

2.03. QUICKLIME (MASON'S LIME)

A. Provide quicklime, as a dry powder in a tank, to form a lime slurry.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide a completed course of treated materials containing a uniform lime mixture, free from loose or segregated areas, of required density and moisture content, well bound for its full depth, and with a smooth surface and suitable for placement of subsequent courses.

B. Regulate sequence work, use proper amounts of lime, maintain the work and rework the courses as necessary to meet the requirements of this specification.

C. Construct and shape smooth roadbed to conform to typical sections, lines and grades as shown on the plans, or as directed by the ENGINEER.

D. Excavate materials to be treated to the proposed bottom of lime treatment grade, or secondary grade and remove or windrow to expose secondary grade.

E. Correct any wet or unstable material below the secondary grade by scarifying, adding lime and compacting until uniform stability is achieved.

F. Use a cutting or pulverizing machine, as applicable, to remove subgrade material accurately to secondary grade and to pulverize the material at the same time. When cutting or pulverizing machine is used, the requirement for exposing and windrowing the material is waived.

G. Roll subgrade before use of pulverizing machinery and correct any soft areas that rolling operations shall reveal.

H. Materials for new base and subbase shall be delivered, placed and spread in the required amount per station. The material shall be thoroughly mixed prior to the addition of lime.

I. Lime shall be spread only on that area where first mixing operation can be completed in the same working day.

3.02 SLURRY PLACING

A. Mix lime, in amounts as shown on plans, or as specified by the Materials Engineering Laboratory, with water in trucks or approved distributors and apply as a thin water suspension or slurry. Provide slurry free of objectionable materials.

B. The distribution of lime at the rates shown on the plans, as directed herein, and/or as directed by the ENGINEER, shall be attained by uniformly successive passes over a measured surface of roadway until the proper moisture and lime content is achieved.

C. Lime slurry distributors shall be equipped with an agitator for maintaining lime and water in a uniform mixture.

3.03 DRY PLACING

A. Before applying lime, bring the prepared roadway to approximately optimum moister content. Spread lime by an approved screw type spreader box or by bag distribution at the required rate shown in the plans.

B. Distribute lime at a uniform rate with approved equipment and in such a manner as to reduce scattering of lime to a minimum. Lime shall not be applied when wind conditions, in the opinion of the ENGINEER, will cause objectionable blowing of lime to traffic or adjacent properties.

C. Only hydrated lime may be distributed by bag. Motor graders shall <u>not</u> be used to spread hydrated lime.

D. Sprinkle material until required lime content has been secured.

3.04 MIXING

A. Mixing procedures shall be the same for “Dry Placing” or “Slurry Placing” or lime.

B. Treatment for Materials in Place:

1. Thoroughly mix material and lime using approved road mixers or other approved equipment, until a homogeneous, friable mixture of material is obtained, free from all clods and lumps.

2. Mix as thoroughly as possible at the time of lime application of materials containing plastic clay or other materials not readily mixed with lime, bring to proper moisture content, seal with a pneumatic roller, and leave to cure one to four days, as directed by the ENGINEER.

3. During curing period, material shall be kept moist by method(s) approved by the ENGINEER.

4. Uniformly mix, after required curing time, using approved methods.

5. Clods in soil binder - Lime mixture shall be reduced in size by raking, blading, discing, harrowing, and scarifying or by other approved pulverization methods such that nonslaking aggregates obtained on the No. 4 sieve are removed. The remainder of the material shall meet the following requirements when test dry by laboratory sieves:

Minimum Passing 1 3/4 inch	100%
Minimum Passing No. 4 Sieve	60%

C. Treatment of New Material

1. Thoroughly mix and blend, using approved road mixers or other approved equipment, the base or subbase material, lime and required water until a homogeneous, friable mixture is obtained.

2. When lime is placed as slurry and mixed by use of blades, the material shall be bladed as the limewater mixture is applied.

D. During the time between application and mixing, hydrated lime that has been exposed to the open air for a period of six hours or more, or to excessive loss due to washing or blowing, shall not be accepted for payment.

3.05 COMPACTION

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than three calendar da

B. Aerate or sprinkle material as required to provide optimum moisture.

C. Compaction shall begin at the bottom and shall continue until entire depth of mixture is uniformly compacted to 95% of maximum density as determined by AASHTO T-99, Method C.

D. If any portion fails to meet the density specified, it shall be reworked as required to obtain specified density.

3.06 FINISHING, CURING, AND PREPARATION FOR SURFACING

A. Shape surface after compaction to the required lines, grades, and cross sections, followed by thorough rolling sufficiently light to prevent hair-line cracking.

B. Complete sections shall be moist cured for a minimum of two days before further coursed are added or any traffic permitted, other than sprinkling equipment.

C. The surface or compacted layer shall be kept moist until covered by other base or paving material, or until an application of CSS-1 or 55-1 emulsified asphalt as a curing seal. Curing seal shall be applied as soon as possible after final rolling at a rate of 0.05 to 0.20 gallons per square yard. The exact rate will be as directed by the ENGINEER.

D. No equipment or traffic will be permitted on lime treated materials for 72 hours after application of curing seal.

3.07 MAINTENANCE

A. Maintain the completed lime treated material within the limits of contract, in condition satisfactory to the ENGINEER as to grade, crown and cross section until surface course is constructed.

B. Immediately repair all irregularities and defects that may occur at no cost to the Owner and as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. When included as a separate line item, lime treatment may be measured for payment in square yards for the thickness of material shown on the plans for the surface area of completed and accepted work or lime will be measured by the ton of 2,000 pounds dry weight. Lime treatment shall be paid for at the contract unit price per square yard or paid at the contract unit cost per ton of 2,000 pounds dry weight.

B. When not included as a separate line item, lime treatment shall be considered incidental to the completion of construction and the costs thereof shall be included in the line items provided.

C. The contract unit price for lime treatment shall be the total compensation for preparing roadbed; for loosening, pulverizing, application of lime, water content of slurry mixture and the mixing water; mixing, shaping, sprinkling, compacting, finishing, curing and maintaining; for manipulations required, for all labor, equipment, fuels, tools and incidentals necessary to complete the work.

D. The contract unit price for lime shall be full compensation for furnishing the material; for all freight involved; for all unloading, storing and hauling; and for all labor, equipment, fuels, tools, and incidentals necessary to complete the work.

END OF SECTION

32 12 16
HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Hot mix asphalt concrete (HMAC) pavement shall consist of a binder course, a leveling up course, a surface course or a combination of the courses as shown on the plans, or as directed by the ENGINEER.

B. HMAC pavement shall be composed of a compacted mixture of mineral aggregate and asphaltic material, constructed on previously completed and approved subgrade, subbase course, base course, or existing pavement.

C. HMAC pavement shall be in accordance with the specifications herein and in conformity with the lines, grades, quantities and typical sections in the contract and/or as directed by the ENGINEER.

1.02 QUALITY CONTROL

A. HMAC pavement and its constituent part shall conform to the ASTM, AASHTO and/or TxDOT test methods noted below.

PART 2 - PRODUCTS

2.01 ASPHALTIC MATERIALS

A. Asphalt cement binders shall be uncracked petroleum asphalt and shall be carefully refined, by steam, vacuum, or solvent, from asphaltic or semi-asphaltic base crude petroleum at a temperature not to exceed 700° F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subjected to cracking or produced from a crude petroleum source other than that of the original material. The asphalt cement shall not contain residues from non-asphaltic sources. Asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347° F.

B. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set forth in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that the CONTRACTOR obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, that the CONTRACTOR will remain with that grade throughout the project.

TABLE 2612-1

Specification	AASHTO Test	ASTM Test						
Designation	Method	Method	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Flash Point (Open Cup) Min	T48	D92	--	450	450	450	450	350
Penetration of Orig. Sample at 77º F	T49	D5	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Thin-Film Oven Loss, Hours at 325ºF, % Max	T179	D1754	0.75	0.75	0.75	0.75	1.00	1.00
Test of Residue from Thin-Film Oven Test; % of Orig. Pen., Min.	T49	D5	52	50	50	50	50	50
Ductility at 77º F cm. after los at 325º F, Min.	T51	D113	50	50	100	100	100	100
Solubility in CCl_4 Min.	T44*	None	99.5	99.5	99.5	99.5	99.5	99.5
Reaction to Spot Test	T102**	None	0	0	0	0	0	0

* Procedure No. 1 with CCl_4 substituted for CS_2.

** Using 85% Standard Naphtha Solvent and 15% Xylene.

TABLE 2612-2

TYPE-GRADE	OA-30		OA-175*8		OA-400	
	Min	Max	Min	Max	Min	Max
Penetration at 32º F, 200 g, 60 sec	15	--	--	--	--	--
Penetration at 77º F, 100 g, 5 sec	25	35	150	200	--	--
Penetration at 115º F, 50 g, 5 sec	--	65	--	--	--	--
Ductility at 77º F, 5 cm/min, cms; Original OA	2	--	70	--	--	--
Flash Point COC, ºF	450	--	425	--	425	--
Softening Point, R&B, ºF	185	--	95	130	--	--
Thin Film Oven Test, 1/8 in. Film 50 g, 5 hrs, 325º F, % Loss by wt.	--	0.4	--	1.4	--	20
Penetration of Residue, at 77º F, 100 g, 5 sec % of Original Pen	--	--	40	--	--	--
Ductility of Residue at 77ºF, 5 cm/min, cms	--	--	--	100	--	--
Solubility in Trichloroethylene, %	99	--	99	--	99	--
Spot Test on Original OA	Neg		Neg		Neg	
Float Test at 122º F, sec	--	--	--	--	120	150
Test on 85 to 115 Pen. Residue* Residue by Wt., %	--	--	--	--	75	--
Ductility, 77º F, 5 cm/min: Original Res, cms	--	--	--	--	100	--
Subjected to Thin Film Test, cms	--	--	--	--	100	--

*Determined by Vacuum Distillation (by evaporation if unable to reduce by vacuum).

** For use with Latex Additive only.

TABLE 2612-3

PROPERTIES	AC-1.5		AC-3		AC-5		AC-10		AC-20		AC-40	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Viscosity, 140º F stokes …	150	50	300	100	500	100	1000	200	2000	400	4000	800
Viscosity, 275º F stokes …	0.7	--	1.1	--	1.4	--	1.9	--	2.5	--	3.5	--
Penetration, 77º F 100 g, 5 sec	250	--	210	--	135	--	85	--	55	--	35	--
Flash Point, COC, º F	425	--	425	--	425	--	450	--	450	--	450	--
Solubility in trichloroethylene, percent …	99	--	99	--	99	--	99	--	99	--	99	--
Test on residues from thin film oven test: Viscosity, 140º F stokes …	--	450	--	900	1500	--	3000	--	6000	--	--	12000
Ductility, 77º F, 5 cms per min, cms	100	--	100	--	100	--	70	--	50	--	30	--
Spot Test	Negative for all grades											

C. A minimum of two percent, by weight, latex additive (solids basis) shall be added to the OA-175 Asphalt or to AC-5 Asphalt when specified in the contract. The latex additive shall be governed by the following specifications:

The latex is to be an anionic emulsion of butadiene-styrene low-temperature copolymer in water, stabilized with fatty-acid soap so as to have good storage stability, and possessing the following properties:

Monomer ratio, B/S	70/30
Minimum solids content	67%
Solids content per gal.@ 67%	5.3 lbs.
Coagulum on 80-mesh screen	0.01% max.
Type Anti-oxidant	staining
Mooney viscosity of Polymer (M/L 4@212° F)	100 min.
pH of Latex	9.4 - 10.5
Surface tension	28-42 dynes/cm2

The finished latex-asphalt blend shall meet the following requirements:

Viscosity at 140° F, stokes	1500 max.
Ductility at 39.2° F, 1 cm. per min., cm.	100 min.

D. Asphalt content shall be within the limits noted below:

Table 2612-4

HMAC Type	Percent of Mixture by Weight	Percent of Mixture by Volume
"A"	3.5 - 7.0	8.0 - 16.0
"B"	3.5 - 7.0	8.0 - 16.0
"C"	3.5 - 7.0	8.0 - 16.0
"D"	4.0 - 8.0	9.0 - 19.0
"F"	3.5 - 6.5	8.0 - 16.0

E. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicate the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above-specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.

F. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirements, the material to which such report relates and any work in which it may have been incorporated as an integral component will be only tentatively accepted by the Owner. Final acceptance will be dependent upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefor. The certified test reports and the testing required in connection with the reports will be at the expense to the Owner.

G. Unless otherwise specified in these specifications or in the Supplementary Specifications, the various grades of paving asphalt shall be applied at a temperature range of from 210° F to 325° F, the exact temperature to be determined by the ENGINEER.

H. Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating. The CONTRACTOR shall furnish and keep on the site, at all times, an accurate thermometer suitable for determining the temperature of the paving asphalt.

I. HMAC asphalt shall be the grade having the highest penetration, within specified limits, to produce a mix having a maximum stability of the compacted mixtures.

J. Only one (1) grade of asphalt shall be required unless otherwise shown on the plans or as required by the ENGINEER.

2.02 AGGREGATES

A. HMAC aggregate will be tested in accordance with the following test standards:

AASHTO T-30 Mechanic Testing
AASHTO T-27 Passing No. 200 Sieve
AASHTO T-89 Liquid Limit
AASHTO T-96 Los Angeles Abrasion
AASHTO T-104 Soundness (Magnesium Sulfate)
ASTM C – 131 Resistance to Degradation
ASTM C – 136 Sieve Analysis
ASTM C – 2419 Sand Equivalence Value
TxDOT Tex -106-E Method of Calculating Plasticity Index of Solids
TxDOT Tex-217 – F (I & II) Determination of Deleterious Materials and Decantation Test
TxDOT Tex-203 – F Quality Tests for Mineral Aggregates

B. Aggregates shall have an abrasion of not more than 40 for all courses except the non-skid surface course, which shall have an abrasion of not more than 35.

C. When properly proportioned, HMAC aggregate shall produce a gradation which will conform to the limitations for classification for HMAC type shown below, or as directed by the ENGINEER.

D. Course aggregate to be crushed limestone rock or crushed gravel with hydrated lime or limestone filler. (Crushed gravel shall be per TxDOT Specifications.)

E. Binder aggregate to be composed of 15% crushed limestone screening or as directed by the engineer.

1. Type "A" - Course Graded Base Course

	Percent Aggregate by Weight or Volume
Passing 2" sieve	100
Passing 1-3/4" sieve	95 to 100
Passing 1-3/4" sieve, retained on 7/8"sieve	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	10 to 26
Passing No. 4 sieve, retained on No. 10 sieve	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No. 10 sieve, retained on No. 40 sieve	5 to 21
Passing No. 40 sieve, retained on No. 80 sieve	3 to 16
Passing No. 80 sieve, retained on No. 200 sieve	2 to 16
Passing No. 200 sieve	1 to 8

2. Type "B" - Fine Graded or Leveling-Up Course

	Percent Aggregate by Weight or Volume
Passing 1" sieve	100
Passing 7/8" sieve	95 to 100
Passing 7/8" sieve, retained on 3/8" sieve	21 to 53
Passing 3/8" sieve, retained on No. 4 sieve	11 to 42
Passing No. 4 sieve, retained on No. 10 sieve	5 to 26
Total retained on No. 10 sieve	58 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 21
Passing No. 80 sieve, retained on No. 200 sieve	3 to 21
Passing No. 200 sieve	1 to 8

3. Type "C" - Course Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 7/8" sieve	100
Passing 5/8" sieve	95 to 100
Passing 5/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	11 to 37
Passing No. 4 sieve, retained on No. 10 sieve	11 to 32
Total retained on No. 10 sieve	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve	3 to 27
Passing No. 200 sieve	1 to 8

4. Type "D" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 1/2" sieve	100
Passing 3/8" sieve	85 to 100
Passing 3/8" sieve, retained on No. 4 sieve	21 to 53
Passing No. 4 sieve, retained on No. 10 sieve	11 to 32
Total retained on No. 10 sieve	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve	3 to 27
Passing No. 200 sieve	1 to 8

5. Type "F" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 3/8" sieve	100
Passing No. 4 sieve	95 to 100
Passing No. 4 sieve, retained on No. 10 sieve	58 to 73
Passing No. 10 sieve, retained on No. 40 sieve	6 to 26
Passing No. 40 sieve, retained on No. 80 sieve	3 to 13
Passing No. 80 sieve, retained on No. 200 sieve	2 to 11
Passing No. 200 sieve	1 to 8

2.03 PRIME COAT

A. Prime coat, when specified on the plans, or directed by the ENGINEER, shall be in accordance with Section 02610 - Prime Coat, and as specified herein.

B. Prime coat shall be applied to the surfaces of bases at least 12 hours prior to placing the HMAC unless otherwise directed by the ENGINEER.

C. Asphalt prime shall be applied uniformly at the rate in accordance with Section 02610 - Prime Coat.

D. In order to prevent lapping at the junction of two applications, the distributor shall be promptly shut off. A hand spray shall be used to touch up all spots unavoidably missed by the distributor.

E. Immediately prior to application of the asphalt prime, an inspection will be made by the ENGINEER to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with cover aggregate.

F. The surface to be primed shall be in a smooth and well-compacted condition, true to grade and cross section, and free from ruts and inequalities.

G. The pressure distributor used for applying prime coat material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to enable him to maintain the constant speed required for application at the specified rate.

H. The pressure distributor shall be equipped with a tachometer registering the pump speed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by the ENGINEER by more than 10%. Suitable means for accuracy indicating at all times the temperature of the prime material shall be provided. The thermometer well shall be so placed as not to be in contact with a heating tube.

I. The distributor shall be so designed that the normal width of application shall be not less than 6 feet, with provisions for the application of lesser width when necessary. If provided with heating attachments, the distributor shall be so equipped and operated that the prime material shall be circulated or agitated through the entire heating process.

J. The asphalt prime coat should preferably be entirely absorbed by the base course and, therefore, require no sand cover. If, however, it has not been completely absorbed prior to the start of

placing the asphalt concrete mixture and in the meantime it is necessary to permit traffic thereon, sufficient sand shall be spread over the surface to blot up the excess liquid asphalt and prevent it from being picked it up by traffic. Also, sand shall be used in areas where traffic may pass over the prime coat. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base. If a sand cover is specified in the Supplementary Specifications or noted on the plans to cover asphalt prime, it shall be applied within 4 hours after the application of said prime coat, unless otherwise ordered by the ENGINEER.

K. Liquid asphalt shall be prevented from being sprayed upon adjacent pavements, structures, guard rails, guide posts, culvert markers, trees, and shrubbery that are not to be removed; adjacent property and improvements; other facilities or that portion of the traveled way being used by traffic.

L. The CONTRACTOR shall protect the prime coat against all damage and markings, both from foot and vehicle traffic. Barricades shall be placed where necessary to protect the prime coat. If, after the prime coat has been applied to the satisfaction of the ENGINEER and has been accepted, if it is disturbed by negligence on the part of the CONTRACTOR, it shall be restored at his expense to its condition at the time of acceptance. No material shall be placed until the prime coat is in a condition satisfactory to the ENGINEER.

2.04 TACK COAT

A. If the asphalt concrete pavement is being constructed directly upon an existing hard-surfaced pavement, a tack coat shall be evenly and uniformly applied to the existing pavement prior to the placing of the new asphalt concrete. The surface shall be free of water, all-foreign material, or dust when the tack coat is applied. No area shall be treated in any one day greater than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.

B. Tack coat for HMAC shall consist of either rapid curing cut-back asphalt RC-2 diluted by addition of (not to exceed 15 percent by volume) an approved grade of gasoline and/or kerosene; emulsified asphalt, EA-11M diluted with 50 percent water, or a cut-back asphalt made by combining 50 to 70 percent of the asphaltic materials specified for the paving mixture with 30 to 50 percent gasoline and/or kerosene by volume.

C. Tack coat shall conform to the requirements of Section 02620 - Tack Coat, or as specified herein.

D. Application of tack coat shall be 0.10 to 0.15 gallons per square yard, or as directed by the ENGINEER.

E. A similar tack coat shall be applied to the surface of any course if, in the opinion of the ENGINEER, the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.

F. When required, the contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the adjoining asphalt concrete is placed. Asphalt tack coat shall be applied in controlled amounts as shown on the plans or determined by the ENGINEER. Surfaces where a tack coat is required shall be cleaned to the satisfaction of the ENGINEER before the tack coat is applied.

2.05 MINERAL FILLER

A. Mineral filler, other than hydrated lime, shall consist of a thoroughly dry stone dust, portland cement or other mineral dust approved by the ENGINEER.

B. The mineral filler shall be free from foreign or other deleterious matter.

C. When tested by the method outlined in TxDOT Test Method Tex-200-F (Part 1 or 3), mineral filler shall meet the following gradations by weight:

Passing No. 30 Sieve	95-100%
Passing No. 80 Sieve	75%
Passing No. 200 Sieve	55%

2.06 ANTI-STRIPPING COMPOUND

A. Anti-Stripping compound, as required in the job mix formula, shall be furnished in the amounts calculated therein.

2.07 JOB MIX FORMULA

A. A job mix formula based on representative samples, including filler if required, shall be determined submitted by the CONTRACTOR for approval of the ENGINEER.

B. The resultant job mix formula shall be within the master range for the specified type of HMAC.

C. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size and a single percentage of bituminous material to be added to the aggregate and shall provide for 3 to 5% air voids in the resultant design mix. During the mix design process the following factors will be considered: air voids, Marshall stability, durability, water resistance, and asphalt film thickness.

D. After the job mix formula is established, mixtures for the project shall conform to the following tolerances which may fall outside of the specified master range:

	Percent by Weight or Volume as Applicable	
Passing 1-3/4" sieve, retained on 7/8" sieve		± 5
Passing 7/8" sieve, retained on 5/8" sieve		± 5
Passing 5/8" sieve, retained on 3/8" sieve		± 5
Passing 3/8" sieve, retained on No.4 sieve	± 5	
Passing No.4 sieve, retained on No.10 sieve	± 5	
Total retained on No.10 sieve	± 5	
Passing No.10 sieve, retained on No.40 sieve	± 3	
Passing No.40 sieve, retained on No.80 sieve		± 3
Passing No.80 sieve, retained on No.200 sieve	± 3	
Passing No.200 sieve	± 3	
Asphaltic Material	± 0.05 by wt or 1.2 by vol.	
Mixing Temperature	± 20° F	

E. Asphaltic mixture shall be tested in accordance with TxDOT Test Method Tex-200-4 (Part I or Part III) and shall have the following laboratory values:

		Surface Course	Base Course
Density:	Minimum	95%	95%
	Maximum	98%	99%
	Optimum	96.5%	96.5%
Stability (Hveem)			
	Minimum	30%	30%
	Maximum	45%	45%
Stability (Marshall – 75 Blow Briquette)		1500 lbs	1500 lbs.
Voids		3 - 7%	4 - 7%
Voids Filled With Asphalt		75 - 85%	65 - 80%
Sand Equivalent		40	40

2.07 EQUIPMENT

A. All equipment for the handling of all material, mixing, and placing of HMAC shall be in accordance with the provisions of TxDOT Item 340.

2.09 STOCKPILING, STORAGE, PROPORTIONING AND MIXING

A. Stockpiling, storage proportioning and mixing operations shall be in accordance with the Provisions of TxDOT Item 340.

PART 3 - EXECUTION

3.01 WEATHER AND TEMPERATURE LIMITATIONS:

A. Asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall not be placed when the air temperature is 50° F and falling, but may be placed when the air temperature is 40° F and rising.

B. Asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is less than or equal to 60° F and falling, but may be placed when the air temperature is greater than or equal to 50° F and rising.

C. Mat thicknesses of 1 inch or less shall not be placed when the temperature on which the mat is to be laid is below 50° F.

D. No tack coat or asphaltic mixture shall be placed when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the ENGINEER, are unsuitable.

E. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50° F or more below the temperature established by the ENGINEER, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.02 EQUIPMENT

A. Hauling Equipment:

1. Trucks used for hauling asphaltic mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a minimal amount of paraffin oil, lime slurry, tine solution or other approved material to prevent mixture adhesion to the bed.

2. The dispatching of hauling equipment shall be arranged so that all material delivered may be placed and all rolling completed during daylight hours, unless otherwise directed by the ENGINEER.

3. All trucks shall be equipped with a cover of canvas, or other suitable material to protect the mixture from weather or on hauls where the temperature of the mixture will fall below specified level. Use of covers will be as directed by the ENGINEER.

B. Rollers:

1. Pneumatic Tire Roller. This roller shall consist of not less than seven pneumatic tire wheels, running on axles in such manner that the rear group of tires shall cover the entire gap between adjacent tires of the forward group; mounted in a rigid frame; and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The tire shall provide surface contact pressures up to 90 pounds per square inch or more. The roller shall be so constructed as to operate in both a forward and a reverse

direction with suitable provisions for moistening the surface of the tires while operating; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.

2. Two Axle Tandem Roller. This roller shall be an acceptable power-driven, steel-wheel, tandem roller weighing not less than eight tons. It must operate in forward and reverse directions; contain provision for moistening the surface of the wheels while in motion; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.

3. Three Wheel Roller. This roller shall be an acceptable power- driven, all steel, three wheel roller weighing not less than 10 tons. It must operate in forward and reverse directions; contain provisions for moistening the surface of the wheel while in motion; and shall be approved by the ENGINEER. It shall be operated in accordance with the manufacturer's recommendations.

4. Vibratory Steel Wheel Roller. If approved for use by the OWNER, this roller shall have a minimum weight of six tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used. It shall be operated in accordance with the manufacturer's recommendations.

C. Straight Edges:

1. The CONTRACTOR shall provide an acceptable 16-foot straight-edge for surface testing. Satisfactory templates shall be provided as required by the ENGINEER.

D. Spreading and Finishing Machine:

1. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans.

2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. Design will be such that no part of the truck weight will be supported by the paver.

3. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The screed shall be adjustable for both height and crown and shall be equipped with a controlled heating device.

4. The bituminous paver shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except that these requirements will not apply when asphalt concrete is placed adjacent to portland cement concrete pavement. Subsequent passes may utilize the matching device of one foot minimum length riding on the adjacent lay.

3.03 CONSTRUCTION METHODS

A. Spreading and Finishing:

1. The asphalt concrete mixture shall be laid on the approved surface, spread and struck off to the grade and elevation established. It shall be spread and compacted in layers as shown on the plans or as directed by the ENGINEER. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

2. The ENGINEER will determine a minimum placement temperature within a range from 220° F to 300° F which will produce the required density. The established placement temperature, which is measured immediately behind the laydown machine, shall not vary more than 20° F.

3. A conventional paver or suitable equipment approved by the ENGINEER may be used to place asphalt concrete material on shoulders depressed from the traveled lanes in order to establish a uniform typical section. Approval of the equipment used will be based upon the results obtained.

4. The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded into the paving machine; however, no asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than 250 feet in front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped shall be picked up and loaded into the paving machine.

5. To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to insure continuous operation.

6. The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end independently, including any screed attachment used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.

7. When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of alignment.

8. All courses of asphaltic concrete shall be placed and finished by means of self-propelled paving machines except under certain conditions or at certain locations where the ENGINEER deems the use of self-propelled, paving machines impracticable.

9. Self-propelled paving machines shall spread the asphaltic concrete without segregation or tearing within the specified tolerances, true to the line, grade, and crown indicated on the plans. Pavers shall be equipped with hoppers and augers which will place the asphaltic concrete evenly in front of adjustable screeds without segregation. Screeds shall include any strike-off device operated by tamping or vibrating action which is effective without tearing, shoving or gouging the asphaltic concrete and which produces a finished surface of an even and uniform texture for the full width being paved. Screeds shall be adjustable

as to height and crown and shall be equipped with a controlled heating device for use when required.

10. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, fluted and compacted with hand tools. For such areas the mixture shall be dumped, spread and screed to give the required compacted thickness.

B. Compaction:

1. Rolling with the 3-wheel and tandem roller shall start longitudinally at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels.

2. Alternate trips of the roller shall be slightly different in length.

3. Rolling with a pneumatic tired roller shall be as directed by the ENGINEER.

4. Rolling shall continue with no further compression can be obtained and all roller marks are eliminated.

5. The motion of the roller shall be slow enough at all times to avoid displacement of asphaltic materials. If displacement occurs, it shall be corrected immediately by use of rakes and fresh asphaltic mixtures, where required.

6. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool.

7. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water; however, excess water shall not be allowed.

8. All precautions shall be taken to prevent dripping of gasoline, oil, grease, or other foreign substances on the surface or base courses during rolling operations or while rollers are standing.

9. With the approval of the ENGINEER, a vibratory steel wheeled roller may be substituted for the 3-wheel roller and tandem roller.

10. Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

11. Any mixture that becomes loose, broken, mixed with dirt, segregated, or is in any way defective shall be removed and replaced with fresh hot bituminous mixture, which shall be compacted to conform with the surrounding area. Any area showing excess or deficiency of bituminous material shall be corrected immediately as directed by the ENGINEER.

C. In-Place Density:

1. In-place density shall be required for all mixtures except thin irregular depth leveling courses.

2. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory test method outlined in TxDOT Bulletin C-14.

3. Density shall be determined with a portable nuclear test device in conformity with ASTM D-2950.76.

4. Calibration of the portable nuclear device will be established by the ENGINEER from cut pavement samples tested in accordance with AASHTO T-166 (weight, volume method). The density readings of the cut pavement samples determined in accordance with AASHTO T-166 (weight, volume method), and the density readings of the pavement samples determined by the portable nuclear test device in conformity with ASTM D 2950 will be correlated by the ENGINEER.

5. Other methods of determining in-place density may be used as deemed necessary by the ENGINEER.

6. It is intended that acceptance density testing will be done while the bituminous mixture is hot enough to permit further compaction if necessary. If the density of an acceptance section does not meet the specified requirements, the CONTRACTOR shall continue the compaction effort until the optimum density is obtained. Rolling for any compactive effort will not be allowed when the temperature of the mix is below 175° F unless authorized in writing by the ENGINEER. Rerolling the paved surface after it has initially cooled will not be allowed.

7. If in-place density tests of the mixture produce a value lower than specified and in the opinion of the ENGINEER is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction procedures until in-place density equals or exceeds the specified density.

8. In-place density tests will be provided by the ENGINEER unless otherwise specified.

D. Joints:

1. Placing of the asphalt concrete shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the ENGINEER.

2. When plant mix bituminous pavement is placed over plant mix bituminous treated base or when plant mixed seal coat is placed over plant mix bituminous pavement, longitudinal joints shall be staggered at least 6 inches with relation to the longitudinal joints of the underlying course.

3. Transverse joints shall have a two foot or 12:1 minimum taper. Longitudinal joints shall have a one foot or 6:1 minimum taper. All transverse tapers shall be cut and squared off prior to commencing new work. Tapered longitudinal joints from previous operations shall be cleaned and tack coated if directed by the ENGINEER. All joints shall be completely bonded. The surface of each course at all joints shall be smooth and shall not show any deviations in excess of 3/16 of an inch when tested with a 10-foot straightedge in any direction.

4. When paving under traffic, the CONTRACTOR shall plan his daily surfacing operations on a schedule which will result in not more than one (1) day's operation of exposed longitudinal joints. The longitudinal joints shall not have a height greater than two (2) inches and shall not be left exposed longer than 24 hours.

E. Surface Tolerance:

1. Upon completion, the pavement shall be true to grade and cross section. Except at intersections or any changes of grade, when a 16 foot straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straight edge more than 1/16-inch per foot. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain any water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the ENGINEER at the expense of the CONTRACTOR.

F. Manholes and Valve Covers:

1. Manhole frames and valve covers shall be adjusted prior to placing the surface course.

G. Compacted Thickness of HMAC Surface and Base Courses:

1. Surface Courses. The compacted thickness or depth of the asphaltic concrete surface course shall be as shown on the plans. Where the plans require a depth or thickness of the surface course greater than two inches compacted depth, same shall be placed in multiple courses of equal depth, each of which shall not exceed two inches compacted depth. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple courses, it shall be applied at the rate as directed.

2. Base Courses. The compacted thickness or depth of each base course shall be as shown on the plans. Where the plans require a depth or thickness of the course greater than 4 inches, same shall be accomplished by constructing multiple lifts of approximately equal depth, each of which shall not exceed these maximum compacted depths. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as hereinbefore specified and at the rate as directed.

H. Pavement Thickness Tests:

1. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the ENGINEER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the ENGINEER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR's expense.

I. Price Adjustment for Roadway Density

1. The payment of the unit price will be adjusted for roadway density as outlined in the following table. The adjustment will be applied on a lot by lot basis for each lift. The adjustment will be based on the average of five density tests. The price adjustment will be applied to the entire

asphalt concrete mix which includes the HMAC aggregate, the asphalt cement and anti-stripping compound, if used.

Average Density % of Lab Density	Percent of Contract Price To Be Paid
Above 95%	100%
94.0 to 94.99	96%
93.0 to 93.99	91%
92.0 to 92.99	85%
Less than 92.00	*

* This lot shall be removed and replaced to meet specification requirements as ordered by the ENGINEER. In lieu thereof, the CONTRACTOR and the ENGINEER may agree in writing that for practical purposes, the lot shall not be removed and will be paid for at 50% of the contract price.

PART 4 - MEASUREMENT AND PAYMENT

4.01 INCIDENTAL WORK

A. Prime coat, anti-stripping compound, where used, and tack coat shall not be measured for direct payment, but shall be considered as subsidiary work pertaining to the placing of asphaltic mixtures of the contract price.

4.02 MEASUREMENT

A. Hot-mix asphalt concrete material shall be measured by the ton of 2,000 pounds or by the square yard of the type or types used in the completed and accepted work, as shown on the Bid Proposal.

B. Weight shall be determined by a certified scale approved by the OWNER and recorded serially numbered weight tickets, identifying the vehicle and presented to the ENGINEER's representative on the job.

4.03 PAYMENT

A. Work performed and materials furnished, as prescribed by this item, measured as provided herein, shall be paid at the unit bid price per ton or square yard for the type or types of hot mix asphalt concrete pavement shown on the proposal.

B. Unit bid price shall be payment in full for quarrying; furnishing all materials; for all heating; mixing; hauling; cleaning existing base course or pavement; placing asphaltic mixtures; rolling and finishing; and for all labor, tools, equipment and incidentals necessary to complete the work, including the work and materials involved in the application of prime coat and tack coat.

END OF SECTION

32 12 70

FLEXIBLE BASE

PART I - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This work shall consist of furnishing and placing a foundation course for surface courses or for other base courses.

B. Flexible base shall be composed of either caliche (argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, sand or other granular materials), crushed stone, gravel, iron ore topsoil, shell, or crushed slag.

C. Flexible base shall be constructed as specified herein in one or more courses in conformance with the details, lines and grades shown on the plans, and as established by the ENGINEER.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Materials for flexible base shall be crushed or uncrushed as necessary to comply with the requirements hereinafter specified.

B. Materials shall consist of durable, coarse aggregate particles mixed with approved binding materials.

2.02 LIME STABILIZATION

A. Where shown on the plans, or directed by the ENGINEER, material for flexible base shall be lime stabilized in accordance with the provisions of Section 02240.

2.03 TYPES

A. Type A - Crushed or broken aggregate (excluding gravel aggregate).

B. Type B - Gravel Aggregate

C. Type F - Caliche

2.04 GRADES

A. Unless otherwise shown on the plans or directed by the ENGINEER, the final course of base material shall consist of Grades 1, 2, 3, or 4, as specified in Table 02601-1.

B. Base courses or subbase materials, unless otherwise noted on the plans or directed by the ENGINEER, may consist of Grades 1, 2, 3, or 4, as specified in Table 02601-1.

C. All grades shall, when tested in accordance with standard laboratory test procedures, meet the physical requirements set forth in Table 02601-1.

D. Testing of flexible base materials shall be in accordance with the following test procedures:

TEST	TESTING PROCEDURE
Preparation for soil constants and sieve analysis	TEX-101-E
Liquid Limit	TEX-104-E
Plastic Limit	TEX-105-E
Plasticity Index	TEX-106-E
Sieve Analysis	TEX-110-E
Wet Ball Mill	TEX-116-E
Triaxial Test	TEX-117-E (Part I or II)

E. Unless otherwise specified on the plans, samples for testing the material for Soil constants, Gradation and Wet Ball Mill shall be taken prior to the compaction operations.

F. Unless otherwise specified on the plans, samples for triaxial tests shall be taken from the stockpile or from production, as directed by the ENGINEER, where stockpiling is required and from production where stockpiling is not required.

TABLE 02601-1

PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS

TYPES	GRADES							
	Grade 1		Grade 2		Grade 3		Grade 4	
	Triaxial Class 1, Min. compressive strength, psi: 45 to 0 psi lateral pressure and 175 at 15 psi lateral pressure		(Triaxial Class 1 to 2.4) Min. compressive strength, psi: 35 to 0 psi lateral pressure and 175 at 15 psi lateral pressure		(Unspecified Triaxial Class)		(Unspecified Triaxial Class)	
TYPE A	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%
Crushed or Broken Aggregate (excluding gravel aggregate)	1-3/4	0	1-3/4	0-10	1-3/4	0-10	As Shown on Plans	
	7/8"	10-35	No. 4	45-75	No. 40	60-85		
	3/8"	30-50	No. 40	60-85	Max LL	45		
	No. 4	45-65	Max LL	40	Max PI	15		
	No. 40	70-85	Max PI	12	Wet Ball			
	Max LL	35	Wet Ball		Bill Amt	55		
	Max PI	10	Wet Ball Bill Amt	40	Wet Ball Bill Amt	40		
	Wet Ball Bill Amt	40	Max Increase in Passing No. 40	20	Max Increase in Passing No. 40	20		
	Max Increase in Passing No. 40	20						
TYPE B	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%
Gravel Aggregate	N/A		1-3/4	0-10	2-3/4"	0	As Shown on Plans	
			No. 4	30-75	No. 40	45-65		
			No. 40	70-85	Max LL	35		
			Max LL	35	Max PI	12		
			Max PI	12				
			Max PI	12	Max LL	35		
			No. 4	45-65	No. 40	45-65		
			No. 40	50-70	Max LL	35		
			Max LL	35	Max PI	12		

			Max PI	12				
TYPE F	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%	Retained on Sq. Sieve	%
Caliche	N/A		1-3/4	0	1-3/4	0	As Shown on Plans	
			No. 4	45-75	No. 40	50-85		
			No. 40	50-85	Max LL	40		
			Max LL	40	Max PI	12		
			Max PI	12				

G. Materials exhibiting reasonably close conformity with the specified gradation and plasticity index are defined by the following criteria:

1. The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.

2. The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.05 STOCKPILING

A. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.

B. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stockpile for delivery to the road.

C. In loading from the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.

D. If the CONTRACTOR elects to produce the Type A material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the course aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.

E. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that combinations of the materials produced fail to meet all of the specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.

F. The central mixing plant shall be of either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.

G. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

A. The roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.

B. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.

C. Flexible base shall not be placed until the Contractor has verified by proof rolling that the subgrade has been prepared and compacted in conformity with Standard Specification Item 02220, "Subgrade Preparation," to the typical sections, lines and grades indicated on the Drawings. Any deviation shall be corrected and proof rolled prior to placement of the flexible base material.

D. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material.

E. The surface of the subgrade shall be finished to line and grade as established and in conformity with the typical section shown on plans. Any deviation in excess of 1/2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and re-compacting by sprinkling and rolling.

F. Sufficient subgrade shall be prepared in advance to insure satisfactory execution of the work.

G. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes or otherwise disposed of as directed. Any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the ENGINEER.

3.02 PLACEMENT OF FIRST COURSE - TYPE A, TYPE B, TYPE F MATERIAL

A. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section.

B. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered to each 100-foot station.

C. Material deposited upon the subgrade shall be spread and shaped the same day.

D. In the event that inclement weather, or other unforeseen circumstances, renders the spreading of the material during the first 24-hour period impractical, the materials shall be scarified and spread as directed by the ENGINEER.

E. Throughout the entire operation the material shall be sprinkled, if directed, and shall be maintained by blading and, upon completion, shall be smooth and shall conform to the typical section indicated on the Drawings and to the established lines and grades, shall then be bladed, dragged and shaped to conform to typical sections as shown on plans.

F. Each lift shall be sprinkled as required to bring the material to optimum moisture content, then compacted to the extent necessary to provide not less than 95 percent nor more than 100 percent of the maximum dry density as determined in accordance with Test Method Tex-114-E. In addition to the requirements specified for density, the full depth of flexible base material shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section of flexible base material is completed, tests, as necessary, will be made by the Engineer or designated representative. As a minimum, three in-place density tests per section per day will be taken. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.

G. All areas and "nests" of segregated coarse or fine material shall be removed and replaced with well graded material, as directed by the ENGINEER.

H. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplied in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.

I. The course shall be compacted by methods of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control" method of compaction as indicated on the plans, or as directed by the ENGINEER.

1. When the "Ordinary Compaction" method is to be used, the following provisions shall apply:

a) The course shall be sprinkled as required and rolled with approved compaction equipment as directed until a uniform compaction is secured. Throughout this entire operation, the shape of the course shall be maintained by blading. Upon completion, the surface shall be smooth and in conformity with the typical sections shown on plans and the established lines and grades.

b) In the area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing approved material, as required reshaping and re-compacting by sprinkling and rolling.

c) All irregularities, depressions and weak spots which develop in the laid course shall be corrected immediately by scarifying the areas affected, adding approved material as required, reshaping and recompacting by sprinkling and rolling.

2. When the "Density Control" method of compaction is to be used, the following provisions shall apply:

a) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under "Density".

b) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.

c) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.

d) Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to the established lines and grades.

e) In the areas on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section and 16 feet in length, measured longitudinally, shall be corrected by loosening, adding or removing approved material as required, reshaping and recompacting by sprinkling and rolling.

f) All irregularities, depressions, and weak spots which develop shall be corrected immediately by scarifying the areas affected, adding approved material as required, reshaping and recompacting by sprinkling and rolling. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete; it shall be re-compacted and refinished at the sole expense of the CONTRACTOR.

3.03 PLACEMENT OF SUCCEEDING COURSES - ALL MATERIAL TYPES

A. Construction methods shall be the same as prescribed for the first course.

B. Prior to placing the surfacing on the completed base, the base shall be "dry cured" to the extent directed by the ENGINEER.

3.04 REWORKING AN EXISTING BASE COURSE

A. Existing base courses shall be reworked in accordance with TxDOT Item 251, or as directed by the ENGINEER, and result in a section that conforms the approved lines and grades.

3.05 DENSITY CONTROL

A. When the "Density Control" method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.

B. The testing will be as outlined in Test Method Tex-114-E.

C. It is the intent of this specification to provide that the part of the base included in the top 8 inches, immediately below the finished surface of the roadway, be not less than 100 percent of the density, as determined by the compaction ratio method.

D. Field density determination shall be made in accordance with Test Method Tex-115-E.

3.06 TOLERANCES

A. Flexible base will be measured by the square yard of surface area of completed and accepted work based on the thickness of flexible base as shown on the plans.

1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Flexible base will be measure by the square yard of surface area of completed and accepted work based on the thickness of flexible base as shown on the plans.

1. The flexible base shall be measured for depth by the units of 2,000 square yards minimum, with one measurement taken at a location selected by the ENGINEER. There shall be a minimum of three (3) locations measured per project.

2. In that unit where flexible base is deficient by more than 1/2 inch in thickness, the deficiency shall be corrected by scarifying, adding material as required, reshaping and re-compacting by sprinkling and rolling.

1. No additional payment over the contract unit price will be made for any flexible base of a thickness exceeding that required by plans.

B. The CONTRACTOR shall schedule his operations in such a manner as to facilitate the measurement of the pay item.

D. The ENGINEER may accept the work provided no more than 20% depth tests performed are deficient by not more 1/2 inch and where no two consecutive tests on continuous work are outside the specified depth.

4.02 PAYMENT

A. The accepted quantities of flexible base of the type, grade, and compaction method specified will be paid at the contract unit bid price per square yard, complete and in place.

B. Where "Ordinary Compaction" is used, all sprinkling, rolling, and manipulation required will not be paid for directly, but will be incidental to this bid items.

C. The unit prices bid shall each be full compensation for shaping and fine grading the roadbed; for securing and furnishing all materials, including all royalty and freight involved; for furnishing scales and labor involved in weighing the material when required; for loosening, blasting, excavating, screening, crushing and temporary stockpiling when required; for loading all materials for all hauling and delivering on the road; for spreading, mixing, blading, dragging, shaping and finishing, and for all manipulation, labor, tools and incidentals necessary to complete the work.

END OF SECTION

32 16 13

CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This work shall consist of the construction of concrete curb, concrete curb and gutter, concrete gutter or valley gutter, or combination thereof in compliance with the specifications, lines, grades, and details shown on the plans, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete and manufactured curb and gutter materials shall be subject to inspection and tests at plants and construction sites for compliance with quality requirements.

B. Concrete curb and gutter or concrete valley gutter shall be constructed with concrete conforming to the provisions of Section 02630 - Concrete Pavement, or Class "B" concrete conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

C. Pre-formed expansion Joint Filler shall conform to the requirements of AASHTO M-33 or M-153.

D. Linseed Oil shall conform to the requirements of AASHTO D-260.

E. Mineral Spirits shall conform to the requirements of AASHTO D-235.

2.02 FOUNDATION

A. Concrete curb and gutter or concrete valley gutter shall be placed on an approved foundation conforming to the requirements of the following Specifications:

1. Section 02220 - Subgrade Preparation

2. Section 02226 - Excavation, Backfill & Compaction for Pavement

3. Section 02601 - Flexible Base

PART 3 - EXECUTION

3.01 EXCAVATION

A. When required, excavation shall be made to the specified depth, and the base upon which the curb and gutter or valley gutter is to be placed shall be compacted to a firm, even surface conforming to the requirements of Subsection 2.02 above.

B. All soft and unacceptable material shall be removed and replaced with material approved by the ENGINEER in conformance with the requirements of Subsection 2.02 above.

3.02 FORMS

A. Forms shall be of wood or metal, straight, free from warp, and of such construction that facilitates the inspection of the grade and alignment for compliance with the approved plans and specifications.

B. All forms shall extend for the entire depth of the curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placement of the concrete. Flexible forms shall be used in curved sections so that the top surface of the forms will form a smooth, continuous arc.

3.03 MIXING AND PLACING

A. Concrete shall be proportioned, mixed, and placed in accordance with the requirements of Section 02630 – Concrete Pavement and Section 03300 – Cast in Place Concrete.

B. Compaction of the concrete placed in forms shall be by vibration or other acceptable methods.

C. Unless otherwise provided. After initial set, the exposed surfaces of curbs and gutters shall be finished by belting, or with steel or wooden floats then broom finish to achieve a uniform texture to the satisfaction of the Engineer. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the curb and gutter.

3.04 SECTIONS

A. Curb and gutter shall be constructed in sections having a uniform length of 20 feet, unless otherwise directed by the ENGINEER. Except at expansion joints, sections shall be separated by open joints 1/8 inch wide.

3.05 EXPANSION JOINTS

A. Expansion joints shall be formed at the intervals shown on the plans using preformed expansion joints filler having a thickness of 3/4 inch.

B. When the curb and gutter or concrete valley gutter is constructed adjacent to an existing concrete pavement, an expansion joint shall be located between the curb and gutter section and the existing concrete pavement.

3.06 CURING

A. Immediately upon completion of the finishing, the curb and gutter shall be moistened and kept moist for 3 days, or the curb and gutter shall be cured by the use of a membrane-forming material. The method and details of curing shall be subject to the approval of the ENGINEER.

3.07 SURFACE TREATMENT

A. The surface of concrete curb and gutter or concrete valley gutter shall be treated with a solution of Linseed Oil and Mineral Spirits in accordance with the applicable requirements of Section 03300 - Cast-In-Place Concrete.

3.08 BACKFILLING

A. After the concrete has set sufficiently, the spaces in front and behind the curb and gutter section shall be refilled to the required elevation with material approved by the ENGINEER, and shall be thoroughly tamped in layers of not more than 6 inches.

3.09 SLIP-FORM CONCRETE CURB, CONCRETE CURB AND GUTTER OR CONCRETE VALLEY GUTTER

A. Any concrete curb or concrete curb and gutter, except on structures, may be placed using a slip form machine provided that the finished concrete curb or concrete curb and gutter is true to line and grade, the concrete is dense, and of the required surface texture.

B. The concrete shall be of a consistency that it will maintain the shape of the concrete curb or concrete curb and gutter section without support after slip forming.

C. The top and face of the finished concrete curb or concrete curb and gutter shall be true and straight and the top surface of the concrete curb or concrete curb and gutter shall be of uniform width and free from humps, sags, or other irregularities.

D. The forming portion of the slip form machine shall be readily adjustable vertically during the forward motion of the slip form machine to provide a variable height of concrete curb or concrete curb and gutter grade when necessary. A grade line gauge or pointer shall be attached to the slip form machine in such a manner that a continual comparison can be made between the concrete curb or concrete curb and gutter grade as indicated by the offset guidelines.

E. Concrete shall be fed to the slip form machine at a uniform rate. The slip form machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a wet brush. Finishing with a brush application of grout will not be permitted.

F. Transverse weakened planes and expansion joints shall be constructed at right angles to the line of the concrete curb, concrete curb and gutter, or concrete valley gutter.

G. Expansion joints may be constructed by sawing through the concrete curb or concrete curb and gutter section to its full depth. The width of the cut shall be such as to admit the joint filler with a snug fit.

H. The operations of sawing and inserting the joint filler shall be completed before curing the concrete. At the conclusion of the curing period the filler in each joint shall be checked for tightness of fit. Loose filler in any joint shall be mortared in place and cured.

I. Excavation shall be as per Subsection 3.02 above.

J. All remaining provisions of Subsection 2.02 above also apply, unless otherwise specified.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Curb and gutter, curb, and valley gutter shall be measured by the linear foot.

   1. Curb shall be measured along the front face of the section at the finished grade elevation.

   2. Combination curb and gutter will be measured along the face of the curb at the flow line of the gutter.

   3. Valley gutter will be measured along the flow line of the gutter.

B. A deduction in length shall be made for drainage structures, such as catch basins or inlets, in the curb, gutter, or combination thereof.

C. There will be no direct measurement or payment of materials used to construct curb and gutter, curb, or valley gutter.

D. Excavation or construction of embankment for foundation of curb, valley gutter, or combination curb and gutter will not be measured for payment.

4.02 PAYMENT

A. The accepted quantities of curb, valley gutter, and curb and gutter will be paid for at the contract unit bid price per linear foot for each kind and type specified, complete and in place.

B. Foundation preparation by excavating or constructing embankment to the required subgrade elevation is considered incidental to the completion of the work and no direct payment will be made thereof.

C. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

32 30 00.1

CONCRETE SIDEWALKS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This item shall govern the installation of sidewalks, with reinforcing steel, composed of Portland Cement concrete, constructed on an approved subgrades in conformity with the lines and grades established by the plans and details, and for the disposal of all material obtained from such installation. The work to be done under this item shall include all necessary forming, compaction, concrete work, and the removal of all structures or portions thereof such as trees, brush, mail boxes, and all other obstructions necessary to the proposed construction.

PART 2 - MATERIAL

2.01 CONCRETE

A. Materials and proportions used in construction under this item shall conform to the requirements of Class "A" Concrete 4 ½ 5 sack cement mix and shall have a minimum compressive 28 days strength of 3,000 pounds per square inch.

B. Reinforcing Steel - The reinforcing steel shall be a welded wire fabric made from cold-drawn wire smooth with a minimum yield strength of 56,000 pounds per square inch. The style designation shall be 6" x 6" x W 1.4 or Equal. (6" x 6" No. 10 6).

PART 3 - CONSTRUCTION METHOD

A. The subgrade shall be excavated and shaped to line, grade and cross section and if considered necessary in the opinion of the ENGINEER, place 2" of sand cushion, hand tamped and sprinkled. The subgrade shall be moist at the time the concrete is placed.

B. Forms shall be of wood or metal, straight, free from warp, and of a depth equal to the thickness of the finished work. They shall be securely staked to line and grade and maintained in a true position during the depositing of concrete.

C. The reinforcing steel shall be placed in position as shown on the plans. Care shall be taken to keep all reinforcing steel in its proper locations.

D. Sidewalks shall be constructed in sections of the lengths shown on plans. The different sections shall be separated by 2 pre-molded or board joint of the thickness shown on the plans, placed vertically and at right angles to the longitudinal axis of the sidewalk. Where the sidewalk abut a curb or retaining wall, approved expansion material shall be places along their entire length. Similar expansion material shall be placed around all obstructions protruding through sidewalk.

E. Concrete shall be mixed in a manner satisfactory to the Engineer, placed in the forms to the depth specified and spaded and tamped until thoroughly compacted and mortar entirely covers the surface. The top surface shall be floated with a wooden float to a gritty texture to the satisfaction of the Engineer.

F. Sidewalks shall be marked into sections, each 6 feet maximum in length, by the use of approved jointing tools.

G. When completed, the, sidewalks shall be cured in accordance with the requirements of the Item, "Membrane Curing", Type 2, white pigmented.

PART 4 - PAYMENT

A. The work performed and materials furnished as prescribed by the item shall be measured by the square foot of surface area of completed sidewalk. This item will be paid for at contract unit price bid for "Concrete Sidewalks", which price shall be full compensation for preparing the subgrade; for furnishing and placing all materials, including all reinforcing steel and expansion joint materials; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

END OF SECTION

32 30 00.2

CONCRETE CURB AND GUTTER AND VALLEY GUTTER

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This work shall consist of the construction of concrete curb, concrete curb and gutter, concrete gutter or valley gutter, or combination thereof in compliance with these specifications, lines, grades, and details shown on the plans, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete and manufactured curb and gutter materials shall be subject to inspection and tests at plants and construction sites for compliance with quality requirements.

B. Concrete curb and gutter or concrete valley gutter shall be constructed with concrete conforming to the provisions of Section 02614 - Portland Cement Concrete Paving, or Class "B" concrete conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

C. Preformed expansion Joint Filler shall conform to the requirements of AASHTO M-33 or M-153.

D. Linseed Oil shall conform to the requirements of AASHTO D-260.

E. Mineral Spirits shall conform to the requirements of AASHTO D-235.

2.02 FOUNDATION

A. Concrete curb and gutter or concrete valley gutter shall be placed on an approved foundation conforming to the requirements of the following City Of McAllen Specifications:

1. Section 02210 - Subgrade Preparation,

2. Section 02260 - Flexible Base,

3. Section 02230 - Roadway Excavation, Borrow, and Embankment.

PART 3 - EXECUTION

3.01 EXCAVATION

A. When required, excavation shall be made to the specified depth, and the base upon which the curb and gutter or valley gutter is to be placed shall be compacted to a firm, even surface conforming to the requirements of Subsection 2.02 above.

B. All soft and unacceptable material shall be removed an replaced with material approved by the ENGINEER in conformance with the requirements of Subsection 2.02 above.

3.02 FORMS

A. Forms shall be of wood or metal, straight, free from warp, and of such construction that there will be no interference to the inspection of grade or alignment.

B. All forms shall extend for the entire depth of the curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placing of the concrete. Flexible forms shall be used in curved sections so that the top surface of the forms will form a smooth, continuous arc.

3.03 MIXING AND PLACING

A. Concrete shall be proportioned, mixed, and placed in accordance with the requirements of Section 02614 and Section 03300.

B. Compaction of the concrete placed in forms shall be by vibration or other acceptable methods.

C. Unless otherwise provided, the exposed surfaces of curbs and gutters shall be finished by belting or with wooden floats. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the curb and gutter.

3.04 SECTIONS

A. Curb and gutter shall be constructed in sections having a uniform length of 20 feet, unless otherwise directed by the ENGINEER. Sections shall be separated by open joints 1/8 inch wide except at expansion joints.

3.05 EXPANSION JOINTS

A. Expansion joints shall be formed at the intervals shown on the plans using a performed expansion joints filler having a thickness of 3/4 inch.

B. When the curb and gutter is constructed adjacent to or on concrete pavement, expansion joints, shall be located opposite or at expansion joints in the pavement.

3.06 CURING

A. Immediately upon completion of the finishing, the curb and gutter shall be moistened and kept moist for 3 days, or the curb and gutter shall be cured by the use of membrane-forming material. The method and details of curing shall be subject to the approval of the ENGINEER.

3.07 SURFACE TREATMENT

A. The surface of concrete curb and gutter or concrete valley gutter shall be treated with a solution of Linseed Oil and Mineral Spirits in accordance with the applicable requirements of Section 03300 - Cast-In-Place Concrete.

3.08 BACKFILLING

A. After the concrete has set sufficiently, the spaces in front and back of the curb shall be refilled to the required elevation with material approved by the ENGINEER, and shall be thoroughly tamped in layers of not more than 6 inches.

3.09 SLIP-FORM CONCRETE CURB, CONCRETE CURB AND GUTTER OR CONCRETE VALLEY GUTTER

A. Any concrete curb or concrete curb and gutter, except on structures, may be placed using a slip form machine provided that the finished concrete curb or concrete curb and gutter is true to line and grade and the concrete is dense and of the required surface texture.

B. The concrete shall be of a consistency that it will maintain the shape of the concrete curb or concrete curb and gutter section without support after slip forming.

C. The top and face of the finished concrete curb or concrete curb and gutter shall be true an straight and the top surface of the concrete curb or concrete curb and gutter shall be of uniform width and free from humps, sags, or other irregularities.

D. The forming portion of the slip form machine shall be readily adjustable vertically during the forward motion of the slip form machine to provide a variable height of concrete curb or concrete curb and gutter grade when necessary. A grade line gauge or pointer shall be attached to the slip form machine in such a manner that a continual comparison can be made between the concrete curb or concrete curb and gutter grade as indicated by the offset guidelines.

E. Concrete shall be fed to the slip form machine at a uniform rate. The slip form machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a wet brush. Finishing with a brush application of grout will not be permitted.

F. Transverse weakened plane and expansion joints shall be constructed at right angles to the line of the concrete curb, concrete curb and gutter, or concrete valley gutter.

G. Expansion joints may be constructed by sawing through the concrete curb or concrete curb and gutter section to its full depth. The width of the cut shall be such as to admit the joint filler with a snug fit.

H. The operations of sawing and inserting the joint filler shall be completed before curing the concrete. At the conclusion of the curing period the filler in each joint shall be checked for tightness of fit. The loose filler in any joint shall be mortared in place and cured.

I. Excavation shall be as per Subsection 2.02 above.

J. All remaining provisions of Subsection 2.02 above also apply, unless otherwise specified.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Curb and gutter, curb, and valley gutter shall be measured by the linear foot.

1. Curb shall be measured along the front face of the section at the finished grade elevation.

2. Combination curb and gutter will be measured along the face of the curb at the flowline of the gutter.

3. Valley gutter will be measured along the flowline of the gutter.

B. A deduction in length shall be made for drainage structures, such as catch basins or inlets, in the curb, gutter, or combination thereof.

C. There will be no direct measurement or payment of materials used to construct curb and gutter, curb or valley gutter.

D. Excavation or construction of embankment for foundation of curb, valley curb and gutter will not be measured for payment.

4.02 PAYMENT:

A. The accepted quantities of curb, valley gutter, and curb and gutter will be paid for at the contract unit bid price per linear foot for each kind and type specified complete in place.

B. Foundation preparation by excavating or constructing embankment to the required subgrade elevation is considered incidental to the completion of the work and no direct payment will be made therefor.

C. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025

MERCEDES — TEXAS

PROJECT SITE



VICINITY MAP

SOUTH TEXAS ISD SCIENCE ACADEMY
900 MED HIGH DRIVE, MERCEDES, TX 78570

JOCPROJ - SCI CTE AUTOMOTIVE EXPANSION 2025

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SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES , TEXAS

REGISTERED ARCHITECT
DAVID A. MONREAL
19556
STATE OF TEXAS
03/21/2025

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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreall, AIA
Drawn By: IO / CM
Job No. STISD CTE AUTOMOTIVE EXPANSION 2025
Sheet: COVER

GENERAL NOTES:

1. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE UNDERGROUND UTILITIES. WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS, SUFFICIENTLY IN ADVANCE OF OPERATIONS TO PRECLUDE DAMAGE TO SAME. THE CONTRACTOR SHALL CONTACT AS NECESSARY BUT NOT LIMITED TO:

A.E.P.	(877) 373-4858
AT&T	(800) 924-9420
SPECTRUM CABLE	(855) 707-7328
CITY OF WESLACO	(956) 968-3181
TEXAS GAS COMPANY	(800) 700-2443
DIG TESS 811 or	(800) 344-8377

2. CONTRACTOR TO SAW CUT EXISTING ASPHALT PAVEMENT ALONG EDGES OF PROPOSED AGENCY SERVICING THE FACILITY.
3. IN THE EVENT OF DAMAGE TO UNDERGROUND FACILITIES, WHETHER SHOWN OR NOT SHOWN IN THE DRAWINGS, THE CONTRACTOR SHALL MAKE THE NECESSARY REPAIRS TO PLACE THE FACILITIES BACK IN SERVICE AT NO INCREASE IN THE CONTRACTOR'S PRICE AND ALL SUCH REPAIRS SHALL CONFORM TO THE REQUIREMENTS OF THE COMPANY OR
4. THE CONTRACTOR SHALL EXERCISE EXTRA CARE TO PREVENT DAMAGE TO ALL OTHER STRUCTURES IN THE AREA INCLUDING BUILDINGS, FENCES, ROADS, PIPELINES, UTILITIES, ETC., WHETHER PUBLICLY OR PRIVATELY OWNED.
5. UNTIL ACCEPTANCE BY THE ENGINEER OF ANY PART OR ALL OF THE CONSTRUCTION, AS PROVIDED FOR IN THE PLANS AND THESE SPECIFICATIONS, IT SHALL BE UNDER THE CHARGE AND CARE OF THE CONTRACTOR, AND HE SHALL TAKE EVERY NECESSARY PRECAUTION AGAINST INJURY OR DAMAGE TO ANY PART OF THE WORK. THE CONTRACTOR SHALL REBUILD, REPAIR, RESTORE AND MAKE GOOD, AT HIS OWN EXPENSE, ALL INJURIES OR DAMAGE TO ANY PORTION OF THE WORK BEFORE ITS COMPLETION AND ACCEPTANCE.
6. ALL EXISTING UTILITIES SHOWN WITHIN THE SITE AREA AS PER CITY OF WESLACO THE LOCATIONS OF THE UNDERGROUND LINES ARE APPROXIMATE. THE SPOTTING OF THESE LINES SHALL BE COORDINATED WITH THE DISTRICT'S MAINTENANCE AND OPERATIONS DEPARTMENT FOR FIELD VERIFICATION.
7. CONTRACTOR TO COORDINATE ALL WORK WITH THE, CITY OF MERCEDES PUBLIC WORKS DEPARTMENT (956-565-6147) PRIOR TO START OF CONSTRUCTION.
8. CONTRACTOR SHALL VERIFY EXISTING BENCH MARKS TO INSURE ACCURACY. CONTRACTOR SHALL NOTIFY ENGINEER IF CONFLICT APPEARS WITHIN BENCH MARKS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FOR THIS PROJECT FROM THE CITY OF MERCEDES, TEXAS GAS COMPANY, AT&T, AND HIDALGO AND CAMERON COUNTY IRRIGATION DISTRICT No. 9.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AT NO ADDITIONAL COST TO THE OWNER ALL COSTS ASSOCIATED WITH ANY PROTECTION MEASURES THAT WILL BE REQUIRED BY THE CONSTRUCTION/DEMOLITION ACTIVITIES TO SAFEGUARD THE HEALTH, SAFETY AND WELFARE OF THE PUBLIC.
11. NO OPEN TRENCHES OR EXCAVATION SHALL BE LEFT OPEN OVERNIGHT.
12. CONTRACTOR TO PROVIDE PROPER TRAFFIC CONTROL DURING THE CONSTRUCTION APPROVED BY THE CITY OF WESLACO END ENGINEERING TO INSURE THE SAFETY OF THE PUBLIC.
13. CONTRACTOR TO PROVIDE ANY AND ALL TEMPORARY GRAPHIC CONSTRUCTION SIGNS, DIRECTIONAL SIGNS AND ANY OTHER SIGNS THAT MAY BE REQUIRED DURING CONSTRUCTION.
14. ALL STORM MANHOLES TOPS TO HAVE THE CITY OF MERCEDES LOGO.
15. ALL DRIVEWAYS AND SIDEWALKS TO BE RECONSTRUCTED WITH EXISTING LIKE MATERIALS TO BE MINIMUM OF THE FOLLOWING:

ASPHALT DRIVEWAYS :	8" FLEX BASE AND 2" H.M.A.C. (98% COMPACTION)
CONCRETE DRIVEWAYS :	6" REINFORCED CONCRETE (4,000 P.S.I.)
CALICHE DRIVES :	8" FLEX BASE (98% COMPACTION)
CULVERTS :	18" R.C.P.

16. ALL EXISTING PAVEMENT THAT IS DAMAGED TO BE REPLACED WITH 8" FLEX AND 2" H.M.A.C. AND ALL EDGES TO BE SAW CUT.
17. PROPER SEDIMENT CONTROL DEVISES SHALL BE UTILIZED DURING CONSTRUCTION ON ALL DRAINAGE STRUCTURES. ALL GRATE INLETS SHALL HAVE FILTER FABRIC INLET PROTECTION TO PREVENT SOIL EROSION INTO THE DRAINAGE SYSTEM.
18. CONTRACTOR TO PROVIDE ANY AND ALL TEMPORARY GRAPHIC CONSTRUCTION SIGNS DIRECTIONAL SIGNS AND ANY OTHER SIGNS THAT MAY BE REQUIRED DURING CONSTRUCTION.
19. ALL WORK SHALL BE COMPLETED TO THE SATISFACTION OF CITY OF MERCEDES, AND HIDALGO AND CAMERON COUNTY IRRIGATION DISTRICT No. 9.
20. THE CONTRACTOR SHALL BE RESPONSIBLE TO CALL DIG TESS 48 HOURS PRIOR TO COMMENCEMENT OF WORK FOR UTILITY SPOTTING @ (1-800-344-8377).
21. LOCATIONS OF UNDERGROUND FACILITIES ARE FROM BEST INFORMATION AVAILABLE. NEITHER THE OWNER OR ENGINEER, WARRANT THE ACCURACY OF THE INFORMATION PROVIDED. ANY DEVIATIONS SHALL BE CALLED TO THE ENGINEER'S ATTENTION IMMEDIATELY.
22. THE CONTRACTOR SHALL REMOVE ALL FENCES LOCATED WITHIN THE EASEMENTS AND RIGHT OF WAY, INTERFERING WITH CONSTRUCTION OPERATION AND PROVIDE TEMPORARY FENCING DURING CONSTRUCTION. REMOVED FENCES SHALL BE REPLACED WITH A NEW FENCE OR UNDAMAGED ORIGINAL FENCING. REMOVAL AND REPLACEMENT OF EXISTING AND TEMPORARY FENCES SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
23. THE CONTRACTOR SHALL PROVIDE ACCESS TO EXISTING RESIDENCES AT ALL TIMES.
24. ANY DAMAGES TO FENCES, WALKS, OR PRIVATE PROPERTY SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE
25. NO OPEN EXCAVATION SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED. AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AND UNPAVED AREAS SUBJECT TO VEHICULAR LOADING; PLYWOOD, WOOD PLANKING WITH O.S.H.A. ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS NOT SUBJECT TO VEHICULAR LOADING, OR AS APPROVED BY THE ENGINEER.
26. THE PREPARATION OF THESE PLANS REFLECTS INFORMATION, PROVIDED BY OTHERS, ON THE APPROXIMATE LOCATION AND EXISTENCE OF EXISTING UTILITY AND ADJACENT PHYSICAL FEATURES. HOWEVER, THEY DO NOT IMPLY OR AFFIRM THAT ALL UTILITIES OR PHYSICAL FEATURES ARE SHOWN. GENERALLY, UTILITY SERVICE CONNECTIONS ARE NOT INDICATED ON THESE PLANS. CONTRACTOR IS RESPONSIBLE FOR NOTIFICATIONS OF THE OWNER IMMEDIATELY UPON ENCOUNTERING UNFORESEEN CONFLICTS.

GENERAL NOTES (CONT):

28. THE APPROXIMATE LOCATIONS OF KNOWN EXISTING UTILITIES ARE SHOWN, CONTRACTOR SHALL DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATIONS IN THE FIELD PRIOR TO COMMENCING WORK. CONTRACTOR TO BE FULLY RESPONSIBLE FOR DAMAGES WHICH MIGHT OCCUR BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE EXISTING UTILITIES.
29. PUBLIC AND PRIVATE UTILITY LINES AND CUSTOMER SERVICE LINES MAY EXIST THAT ARE NOT SHOWN ON THE CONSTRUCTION DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE, MAINTAIN AND PROTECT THE INTEGRITY OF THESE LINES. HAND EXCAVATION MAY BE REQUIRED. THE CONTRACTOR SHALL RESTORE RELOCATED OR DIVERTED UTILITY TO ITS ORIGINAL CONDITION AND LOCATION WHEN APPLICABLE UPON COMPLETION OF CONSTRUCTION. SAID RESTORATION SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
30. THE CONTRACTOR SHALL ADJUST AND CONNECT TO NEW SYSTEM EXISTING FIELD DRAIN LINES AT PROPOSED LOCATIONS. SAID WORK SHALL BE COORDINATED WITH H.C.C.I.D. No. 9 PRIOR TO COMMENCEMENT OF WORK. SAID LINE ADJUSTMENTS AND CONNECTIONS SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
31. THE CONTRACTOR TO MAINTAIN ALL EQUIPMENT AND TRANSPORTATION OF SAID EQUIPMENT WITHIN THE EXISTING RIGHTS-OF-WAY OF THE CITY, COUNTY, OR STATE.
32. DURING EXCAVATION OPERATIONS FOR DRAINAGE AND/OR UTILITIES, THE CONTRACTOR SHALL NOT PILE EXCAVATED MATERIAL OR EXCAVATE WITHIN THE DRIP LINE OF TREES THAT ARE TO BE PRESERVED.
33. WHERE NEW WATER LINES ARE INSTALLED WITH A SEPARATION DISTANCE CLOSER THAN NINE FEET (I.E., WATER LINES CROSSING WASTEWATER LINES, WATER LINES PARALLELING WASTEWATER LINES, OR WATER LINES NEXT TO MANHOLES) THE INSTALLATION MUST MEET THE REQUIREMENTS OF 30 TAC 317(DESIGN OF SEWAGE SYSTEMS) OR 30 TAC 290 (WATER HYGIENE).
34. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING WATER CONNECTIONS TO ALL HOMES AND BUSINESSES IN WORKING ORDER AT ALL TIMES, EXCEPT FOR BRIEF INTERRUPTIONS IN SERVICE FOR CONNECTIONS TO BE REINSTALLED. IN NO CASE SHALL SERVICES BE ALLOWED TO REMAIN OUT OF SERVICE OVERNIGHT. CONTRACTOR IS RESPONSIBLE FOR DAMAGES TO SAID SERVICES.
35. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ADEQUATE DRAINAGE OF PROPOSED FACILITIES AT ALL TIMES DURING CONSTRUCTION.
36. THE CONTRACTOR SHALL BE RESPONSIBLE FOR GRADING AREA BETWEEN THE BACK OF CURB/EDGE OF PAVEMENT, ROAD SIDE DITCH AND RIGHT-OF-WAY TO HAVE POSITIVE FLOW TO THE PROPOSED DRAINAGE SYSTEM.
37. THE CONTRACTOR SHALL PROVIDE/MAINTAIN ADEQUATE POSITIVE DRAINAGE AT ALL TIMES DURING THE INSTALLATION OF THE STRUCTURES, DRAINAGE, UTILITY, IRRIGATION AND ROAD IMPROVEMENTS. DEWATERING OF THE TRENCH MAY BE REQUIRED DURING THE INSTALLATION OF THE DRAINAGE, UTILITY AND IRRIGATION FACILITIES/STRUCTURES. SAID DEWATERING SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
38. THE CONTRACTOR SHALL CLEANUP AND RESTORE THE AREA OF OPERATIONS TO A CONDITION AS GOOD AS OR BETTER THAN THAT WHICH EXISTED PRIOR TO INSTALLATION OF ALL ITEMS TO BE CONSTRUCTED.
39. ALL DEBRIS, VEGETATION AND SURPLUS MATERIAL, RESULTING FROM DEMOLITION AND/OR CLEARING OF THE RIGHT-OF-WAY IN PREPARATION OF PROPOSED IMPROVEMENTS SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE PROPERLY DISPOSED OF AT A SITE ACCEPTABLE THE CITY OF WESLACO, THE CONTRACTOR SHALL PROVIDE A LETTER STATING SO. THIS SHALL BE INCIDENTAL AND NOT A SEPARATE PAY ITEM UNLESS STATED SO. NO EXCESS EXCAVATED MATERIAL SHALL BE DEPOSITED IN LOW AREAS. IF THE CONTRACTOR PLACES EXCESS MATERIAL IN THE AREAS WITHOUT WRITTEN PERMISSION, HE WILL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM SUCH FILL AND CONTRACTOR SHALL REMOVE THE MATERIAL AT OWN COST.
40. THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION AND SUBMITTAL OF THE TRENCH EXCAVATION PROTECTION PLAN. CONTRACTOR SHALL SUBMIT CONSTRUCTION DETAILS AND DESIGN CALCULATIONS BEARING THE SEAL OF A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS BEFORE CONSTRUCTING THE SHORING AND/OR UTILIZING A TRENCH PROTECTION SYSTEM (BOX). THE ENGINEER RESERVES THE RIGHT TO REJECT DESIGNS NOT MEETING THE REQUIREMENTS OF SECTION ITEM 402 AND 403.
41. THE CONTRACTOR SHALL BE RESPONSIBLE TO FOLLOW ALL T.C.E.Q. STORM WATER POLLUTION PREVENTION PLAN (SWP3) REQUIREMENTS AS PER SWP3 SHEETS AND AS STATED IN TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM CONSTRUCTION GENERAL PERMIT (TPDES TXR150000, EFFECTIVE DATE MAY 5, 2019), INCLUDING N.O.I. SUBMITTAL AND MS4 NOTIFICATION.
42. THE CONTRACTOR SHALL ABANDON AND CAP ANY PORTION OF PIPE LINE (STORM, IRRIGATION, ETC.) FOUND WITHIN THE PROPOSED PIPE TRENCH, AT THE ENGINEERS REQUEST. ONCE APPROVED BY THE ENGINEER, THE PIPE TO BE ABANDONED SHALL BE CAPPED AND SEALED WITH CEMENT AT BOTH ENDS OF THE TRENCH. THIS SHALL BE CONSIDERED SUBSIDIARY UNLESS OTHERWISE STATED.
43. ALL ROAD CROSSINGS SHALL BE REPLACED WITH A MINIMUM OF 8" (98% COMPACTED) CALICHE AND 2" HMAC OR LIKE SECTION, WHICHEVER IS GREATER.
44. THE ENGINEER WILL PROVIDE CONTROL POINTS (BENCHMARK AND PROPERTY CORNERS) FOR THE WORK TO BE PERFORMED BY THE CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION STAKING, INCLUDING BUT NOT LIMITED TO HORIZONTAL & VERTICAL GRADE CUTS FOR CURB & GUTTER, ROADWAY, STORM DRAIN PIPE, ROADSIDE DITCHES, DRIVEWAY CULVERTS AND DITCH WORK.
45. THE CONTRACTOR SHALL CONNECT ANY PROPOSED IRRIGATION LINE WITH EXISTING IRRIGATION PIPE IN ACCORDANCE WITH UNITED IRRIGATION DISTRICT SPECIFICATIONS. SUPPORT COLLARS MAY BE USED. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR ANY DAMAGE TO THE EXIST. LINE CAUSED BY THIS WORK. ELBOWS AND MISC. FITTINGS SHALL ALSO BE USE TO ACHIEVE A 1.0 FT SEPARATION BETWEEN TOP OF PROP. DRAIN LINE AND BOTTOM OF THE IRRIGATION LINE.
46. ELBOW FOR RCP OR HPP BEING PROPOSED AT THE END OF LINES SHALL BE PRE-FABRICATED AND SECURED TO THE PIPE WITH A CONCRETE COLLAR (TYPICAL ON ALL PIPE ELBOW INSTALLATIONS.) ELBOW SHALL BE REQUIRED AT ALL LOCATIONS SHOWN ON THE PLANS. THIS SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL. PRE-FABRICATED ELBOWS SHALL BE FIELD CONFIRMED BY THE CONTRACTOR.
47. THE CONTRACTOR SHALL RELOCATE OR RECONSTRUCT ALL MAIL BOXES TO BE 1' BEHIND BACK OF CURB OR 3' BEHIND EDGE OF PAVEMENT. MAIL BOXES SHALL BE REPLACED TO THE SAME EXISTING CONDITIONS OR BETTER. SAID RELOCATION AND/OR RECONSTRUCTION OF MAIL BOXES SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
48. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL EXISTING WATER VALVES AND MANHOLES TO MATCH PROPOSED FINISH GRADE OF ROADWAY. CONCRETE COLLARS SHALL BE INSTALLED TO MATCH TOPS WITH PAVEMENT GRADE. THIS WORK SHALL BE INCIDENTAL AND NOT A SEPARATE PAY ITEM UNLESS STATED OTHERWISE.
49. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPLACEMENT/RELOCATION OF ALL REGULATORY SIGNS REMOVED DUE TO CONSTRUCTION OPERATIONS WITH THE SAME SIGN ON FIXED SUPPORT(S) IMMEDIATELY UPON ITS REMOVAL. APPROVAL BY THE ENGINEER IS NECESSARY BEFORE REMOVING ANY REGULATORY ROADWAY SIGN(S). FLAGGERS ARE REQUIRED TO BE AVAILABLE TO DIRECT TRAFFIC DURING SIGN INTERMEDIATE DOWN TIME. RELOCATION OF ANY DIRECTIONAL SIGN ASSEMBLIES REMOVED DURING CONSTRUCTION OPERATIONS IMMEDIATELY UPON THEIR REMOVAL IS REQUIRED. THESE SIGNS SHALL BE RELOCATED TO A LOCATION IN ACCORDANCE WITH THE LATEST VERSION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES". IN NO CASE WILL A SIGN BE REMOVEDD WITHOUT A REPLACEMENT SIGN AND SUPPORT(S) BEING READILY AVAILABLE AND A LOCATION ESTABLISHED. REMOVAL AND RELOCATION OF THESE SIGNS WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED ON THE PROPOSAL.
50. ALL CONSTRUCTION OPERATIONS SHALL BE CONDUCTED TO PROVIDE THE LEAST POSSIBLE INTERFERENCE TO TRAFFIC AS PROVIDED FOR IN THE SPECIFICATIONS, TXDOT STANDARDS, TEXAS M.U.T.C.D. AND/OR AS DIRECTED. ALL TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE CURRENT EDITION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

EROSION CONTROL NOTES

1. THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) AND ENVIRONMENTAL PROTECTION AGENCY (EPA) REQUIRE EROSION AND SEDIMENTATION CONTROL FOR CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL REQUIRED EROSION AND SEDIMENTATION CONTROL. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLAN.
2. AT A MINIMUM THESE CONTROLS SHALL CONSIST OF ROCK BERMS AND/OR SILT FENCES CONSTRUCTED PARALLEL TO AND DOWN GRADIENT FROM THE TRENCHES. THE ROCK BERM OR SILT FENCES SHALL BE INSTALLED IN A MANNER SUCH THAT ANY RAINFALL RUNOFF SHALL BE FILTERED. HAY BALES SHALL NOT BE USED FOR TEMPORARY EROSION AND SEDIMENTATION CONTROLS.
3. ALL SLOPES SHALL BE SODDED OR SEEDED WITH APPROVED GRASS, GRASS MIXTURES OR GROUND COVER SUITABLE TO THE AREA AND SEASON IN WHICH THEY ARE APPLIED.
4. THE CONTRACTOR SHALL INSPECT THE CONTROLS AT WEEKLY INTERVALS AND AFTER EVERY SIGNIFICANT RAINFALL TO INSURE DISTURBANCE TO THE STRUCTURES HAS NOT OCCURRED. SEDIMENT DEPOSITED AFTER A RAINFALL SHALL BE REMOVEDD FROM THE SITE OR PLACED IN AN APPROVED DESIGNATED SOIL DISPOSAL AREA.
5. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE EMPLOYED DURING CONSTRUCTION TO PREVENT POINT SOURCE SEDIMENTATION LOADINGS OF DOWNSTREAM FACILITIES. SUCH INSTALLATIONS SHALL BE REGULARLY INSPECTED BY THE CONTRACTOR FOR EFFECTIVENESS. ADDITIONAL MEASURES MAY BE REQUIRED IF, IN THE OPINION OF THE OWNER, THEY ARE WARRANTED.
6. ALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS SHALL BE IMPLEMENTED BEFORE CONSTRUCTION COMMENCES, SHALL BE MAINTAINED DURING CONSTRUCTION, AND SHALL BE REMOVEDD WHEN VEGETATION IS ESTABLISHED AND THE CONSTRUCTION AREA IS STABILIZED. ADDITIONAL PROTECTION MAY BE NECESSARY IF EXCESSIVE SOLIDS ARE BEING DISCHARGED FROM THE SITE.
7. ALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS SHALL BE REMOVEDD BY THE CONTRACTOR AT FINAL ACCEPTANCE OF THE PROJECT BY THE OWNER.
8. ALL STAGING, MATERIAL STORAGE, STOCKPILE AND REFUSE AREAS SHALL REQUIRE APPLICABLE EROSION AND SEDIMENT CONTROL MEASURES.
9. ALL CONSTRUCTION DEBRIS SHALL BE CONTAINED WITHIN APPROPRIATE RECEPTACLES (ROLL-OFF CONTAINERS, DUMPSTERS, TRASH CANS, WIRE-MESH CAGES, Etc.) AND CONFINED WITHIN PERIMETER EROSION AND SEDIMENT CONTROLS.
10. THE CONTRACTOR MAY REFER TO THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES (2004 EDITION) ITEM 164, "SEEDING FOR EROSION CONTROL" AND ITEM 168, "VEGETATIVE WATERING" FOR VEGETATIVE STABILIZATION SPECIFICATIONS.
11. DUST CONTROL SHALL BE IMPLEMENTED AS NECESSARY OR AS DIRECTED BY THE ENGINEER. DUST CONTROL MAY CONSIST OF WATERING OR OTHER METHODS APPROVED BY THE PROJECT ENGINEER.
12. ALL DISCHARGES ASSOCIATED WITH DEWATERING OPERATIONS SHALL IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES. MEASURES MAY INCLUDE BUT ARE NOT LIMITED TO SEDIMENTATION BASINS OR FILTER SOCKS.
13. CONCRETE WASH-WATER SHALL NOT BE DISCHARGED DIRECTLY INTO A STORM SEWER SYSTEM OR RECEIVING STREAM. ALL WASH ACTIVITIES MUST BE PERFORMED WITHIN THE EXTENTS OF ESTABLISHED EROSION AND SEDIMENT CONTROL MEASURES OR DESIGNATED AREAS APPROVED BY PROJECT ENGINEER.
14. SEDIMENT SHALL BE CLEARED FROM ALL STORM SEWER PIPES, CULVERTS AND APPURTENANCES WITHIN THE LIMITS OF CONSTRUCTION PRIOR TO FINAL PROJECT ACCEPTANCE. SEDIMENT SHALL BE PROPERLY DISPOSED.

TRENCH SAFETY

1. IN ACCORDANCE WITH HOUSE BILLS 662 AND 665 ENACTED BY THE TEXAS LEGISLATURE (70TH REGULAR LEGISLATIVE SESSION), THE CONTRACTOR SHALL MEET THE REQUIREMENTS FOR TRENCH SAFETY AS OUTLINED IN THE CURRENT VERSION OF THE UNITED STATES DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS, 29 CFR, PART 1926, SUBPART P- EXCAVATIONS.
2. PRIOR TO COMMENCING ANY EXCAVATION, THE CONTRACTOR SHALL PROVIDE A TRENCH SAFETY PLAN. ALL PLANS SHALL BE PREPARED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS. THE PLAN SHALL BE SUBMITTED TO THE PROJECT ENGINEER.
3. IN THE EVENT CONDITIONS ENCOUNTERED IN THE FIELD REQUIRE TRENCH SAFETY SYSTEMS OUTSIDE OF THE EXTENTS SUGGESTED TRENCH PROTECTION SHOWN ON THE CONSTRUCTION PLANS, ALL EXCAVATION SHALL CEASE AND THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE PROJECT ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING A REVISED TRENCH SAFETY PLAN. NO EXCAVATION SHALL RESUME UNTIL THE REVISED TRENCH SAFETY PLAN HAS BEEN APPROVED.
4. THE CONTRACTOR SHALL ENSURE APPROVED TRENCH SAFETY PLANS ARE IMPLEMENTED. FAILURE TO ADHERE TO THE TRENCH SAFETY PLAN WILL RESULT IN A STOP WORK ORDER. NONCOMPLIANCE INCIDENTS MAY BE REPORTED TO OSHA.
5. TRENCHES OR EXCAVATIONS MAY NOT BE LEFT OPEN OVERNIGHT UNLESS AUTHORIZED IN WRITING BY THE PROJECT ENGINEER. IN CASES WHERE TRENCHES ARE LEFT OPEN, THE CONTRACTOR MUST PROVIDE TRAFFIC RATED, ANCHORED STEEL PLATE COVERS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JAVIER HINOJOSA
74808
REGISTERED PROFESSIONAL ENGINEER

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GENERAL NOTES

SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES, TEXAS

03/21/2025

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Architects-Planners
Interior Designers

Dates 03/21/2025
Scales As Noted
Project Architect: David Monreal, AIA
Drawn By: IO / CM
Job No. STISD CTE AUTOMOTIVE EXPANSION 2025
Sheets C-1

EROSION GENERAL NOTES:

1. IT IS THE INTENT OF THE INFORMATION PROVIDED ON THIS SHEET AND WITHIN THE SPECIFICATIONS TO BE USED AS THE GENERAL GUIDELINES OF THE STORM WATER OF COMPLIANCE WITH FEDERAL REGULATIONS. THE CONTRACTOR SHALL PREPARE THE STORM WATER POLLUTION PREVENTION PLAN AND BE SOLELY RESPONSIBLE FOR ITS IMPLENTATION. THE STORM WATER POLLUTION PREVENTION PLAN SHALL MEET THE REQUIREMENTS SET FORTH BY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TPDES)GENERAL PERMIT NO. TXR15000 TO DISCHARGE WASTE FROM CONSTRUCTION SITES ISSUED AND EFFECTIVE MARCH 5, 2023.

2. THE STORM WATER POLLUTION PLAN SHOULD ADDRESS THREE GOALS: A) DIVERSION OF UPSLOPE WATER AROUND DISTURBED AREAS OF THE SITE; B) LIMITS THE EXPOSURE OF DISTURBED AREAS TO THE SHORTEST DURATION POSSIBLE; AND C) REMOVAL OF SEDIMENT FROM STORM WATER BEFORE IT LEAVES THE SITE.

3. THE CONTRACTOR SHALL MAKE THE STORM WATER POLLUTION PREVENTION PLAN AVAILABLE, UPON REQUEST, TO (EPA).

4. THE CONTRACTOR MUST AMEND PLANS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF THE PLAN, OR WHEN THE EFFECTIVE PLAN PROVES INEFFECTIVE. MODIFICATIONS INCLUDING DESIGN AND ALL ADDITIONAL MATERIALS AND WORK SHALL BE ACCOMPLISHED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE BY THE OWNER.

5. STABILIZATION MEASURES ARE TO BE INSPECTED AT A MINIMUM OF ONCE EVERY 14 DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES. REPAIRS AND INADEQUACIES REVEALED BY THE INSPECTION MUST BE IMPLEMENTED WITHIN 7 CALENDAR DAYS FOLLOWING THE INSPECTION.

6. AN INSPECTION REPORT THAT SUMMARIZES INSPECTION ACTIVITIES AND IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLAN SHALL BE RETAINED AND MADE PART OF THE PLAN.

7. ALL CONTRACTORS AND SUBCONTRACTORS IDENTIFIED IN THE PLAN MUST CERTIFY AS TO AN UNDERSTANDING OF THE NPDES GENERAL PERMIT BEFORE CONDUCTING ANY ACTIVITY IDENTIFIED IN THE POLLUTION PREVENTION PLAN.

8. THE CONTRACTOR SHALL ADOPT APPROPRIATE CONSTRUCTION SITE MANAGEMENT PRACTICES TO PREVENT THE DISCHARGE OF OILS, GREASE, PAINTS, GASOLINE, AND OTHER POLLUTANTS TO STORM WATER. APPROPRIATE PRACTICES CAN INCLUDE: DESIGNATING AREAS FOR EQUIPMENT MAINTENANCE AND REPAIR; REGULAR COLLECTION OF WASTE; CONVENIENTLY LOCATED WASTE RECEPTACLES; AND DESIGNATING AND CONTROLLING EQUIPMENT WASHDOWN.

9. THE CONTRACTOR SHALL AMEND OR MODIFY THIS PLAN AS REQUIRED BY CONSTRUCTION MEANS, METHODS AND SEQUENCE. MODIFICATIONS SHALL NOT COMPROMISE THE INTENT OF REQUIREMENTS OF LAW AND THIS PLAN. MODIFICATIONS SHALL NOT BE BASIS FOR ADDITIONAL COST TO THE OWNER.

10. AREAS OF CONSTRUCTION ELSEWHERE ON THE JOB SITE SHALL CONFORM TO THE DETAILS SHOWN ON THE PLANS.

11. BORROW AREAS, IF EXCAVATED, SHALL BE PROTECTED AND STABILIZED UTILIZING THE PLAN DETAILS. ALL WORK SHALL CONFORM TO GOVERNMENTAL REQUIREMENTS AND BECOME PART OF THE STORM WATER POLLUTION PREVENTION PLAN (SWP3). THE WORK SHALL BE DONE BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.

12. ALL NON-PAVED AREAS SHALL BE MULCHED AND SEEDED WITH EROSION PROTECTION IMMEDIATELY UPON COMPLETION OF FINAL GRADING. THIS INCLUDES ALL DITCHED AND EMBANKMENTS. THE CONTRACTOR SHALL MAINTAIN FINAL GRADING AND KEEP SEEDED AREAS WATERED UNTIL FULLY ESTABLISHED AND ACCEPTED BY THE OWNER.

13. THE CONTRACTOR SHALL CONSTRUCT A STABILIZED CONSTRUCTION EXIT AT ALL TRAFFIC EXIT POINTS PRIOR TO EXITING ONTO ANY PAVED ROADWAY.

NOTES:

1. STONE SHALL BE 3 TO 5 INCH DIA. CRUSHED ROCK OR ACCEPTABLE CRUSHED CEMENT CONCRETE.

2. WHEN NECESSARY, VEHICLES SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHAL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WITH DRAINAGE FLOWING AWAY FROM BOTH THE STREET AND THE STABILIZED ENTRANCE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.

3. THE ENTRANCE SHALL BE PROPERLY GRADED OR INCORPORATE DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

4. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PAVEMENT SURFACES, MUST BE REMOVEDD IMMEDIATELY.

GENERAL NOTES :

1. STEEL POSTS WHICH SUPPORT TH SILT FENCE SHALL BE INSTALLED WITH A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 18".

2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON UPHILL SIDE, AS NECESSARY, TO PREVENT FLOW UNDER FENCE.

3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAND IN THE GROUND AND BACKFILLED.

4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POST OF TO BACKING SUPPORT, WITH IS IN TURN ATTACHED TO THE STEEL FENCE POST FABRIC SHALL OVERLAP AT ABUTTING ENOS A MINIMUM OF 3 FEET AND SHALL BE JOINED SUCH THAT NO BYPASS OR LEAKAGE OCCURS.

5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL, REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

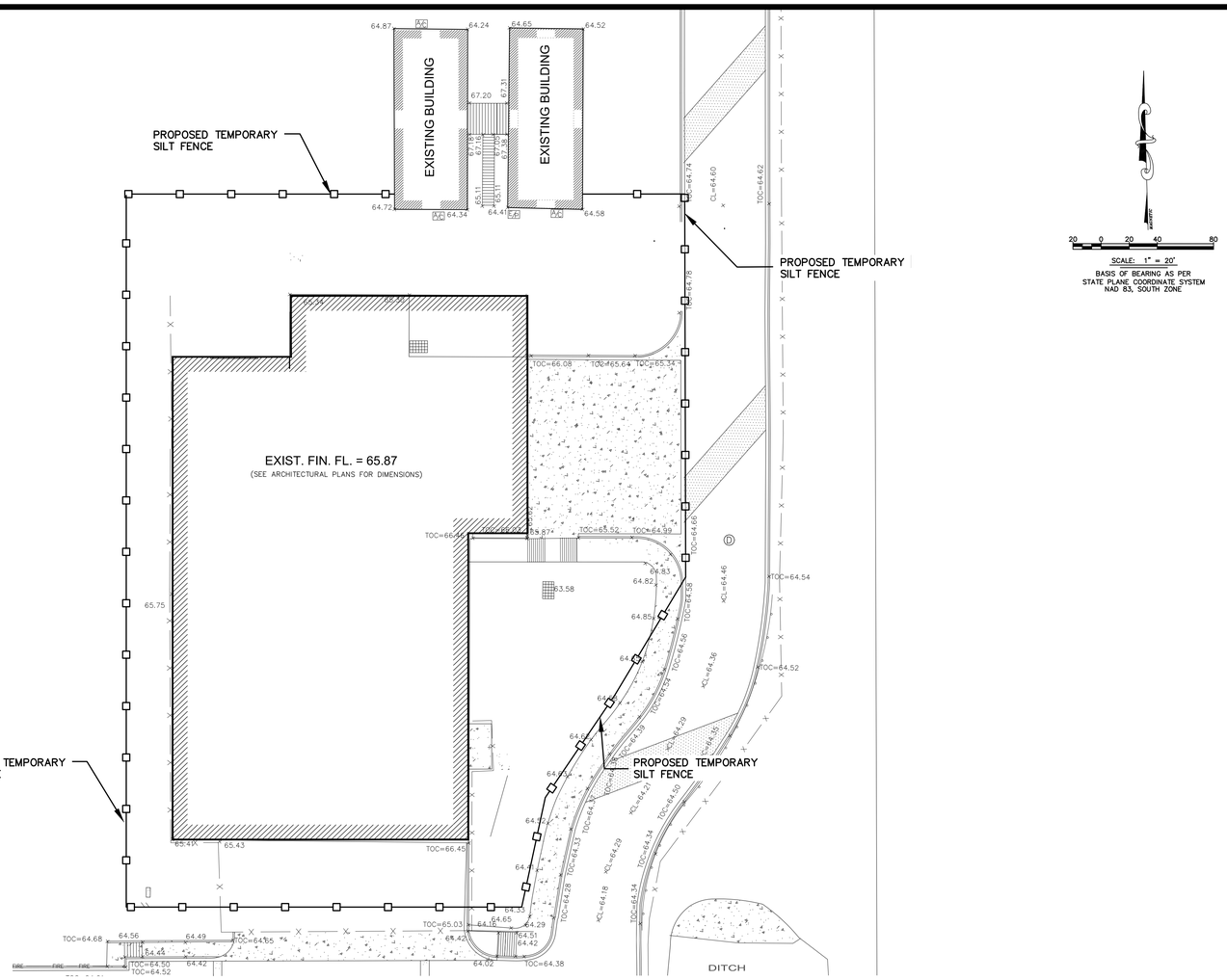
6. SILT FENCE SHALL BE REMOVEDD WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

7. ACCUMULATED SILT SHALL BE REMOVEDD WHEN IT REACHES A DEPTH OF 6 INCHES THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

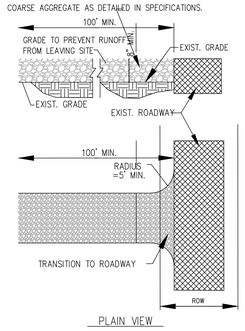
SEDIMENT CONTROL FENCE USAGE GUIDELINES

A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUNOFF. A 2-YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAX. FLOW THROUGH RATE OF 100 GPM/FT. SEDIMENT CONTROL FENCE IS NOT RECOMMENEDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN TWO ACRES.

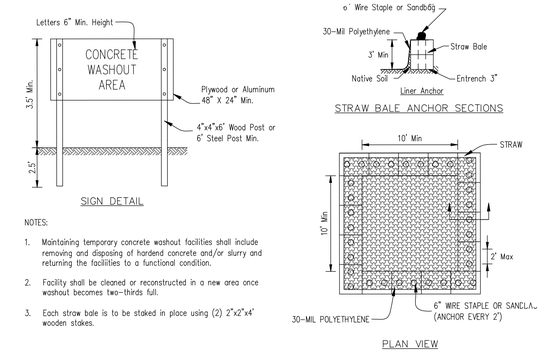


SCALE: 1" = 20'
BASIS OF BEARING AS PER STATE PLANE COORDINATE SYSTEM NAD 83, SOUTH ZONE

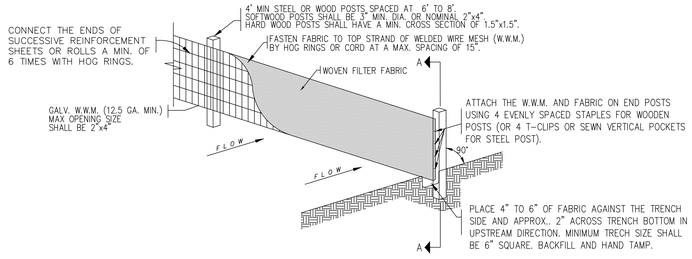


STABILIZED CONSTRUCTION ENTRANCE/EXIT

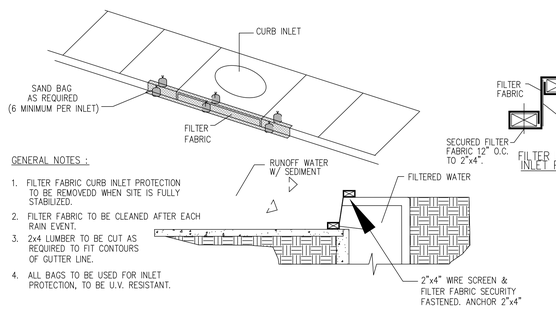
NOTE: CONTRACTOR TO PROVIDE THE FOLLOWING
1. WASHOUT AREA
2. MATERIAL STORAGE AREA
3. FUEL AND CHEMICAL STORAGE AREA



TEMPORARY CONCRETE WASHOUT FACILITY



TEMPORARY SEDIMENT CONTROL FENCE



FILTER FABRIC CURB INLET PROTECTION



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SUGGESTED EROSION CONTROL PLAN

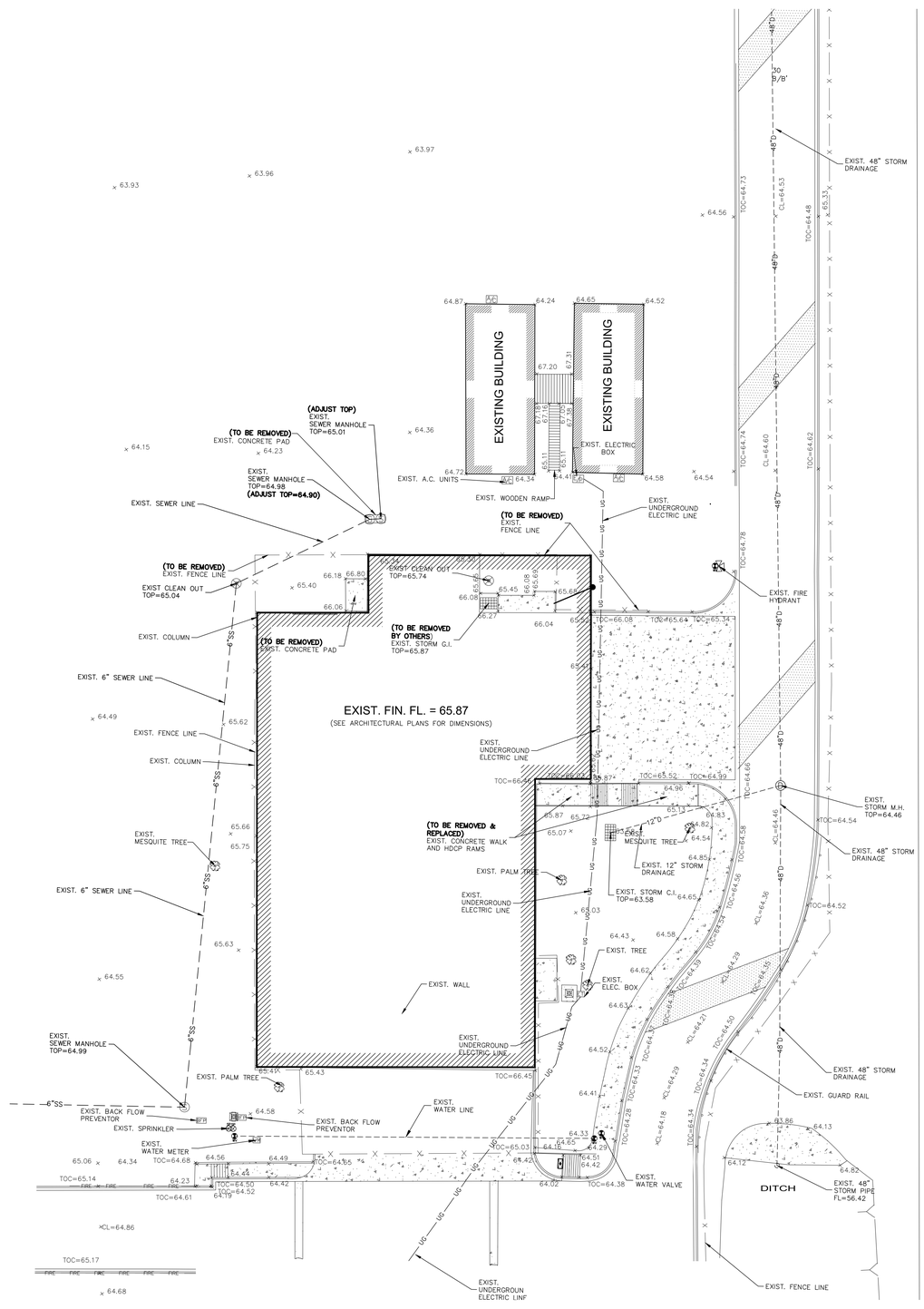
SOUTH TEXAS I.S.D. - MERCEDES

SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES , TEXAS

03/21/2025

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Datea	03/21/2025
Scalex	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	IO / CM
Job No.	STISD CTE AUTOMOTIVE EXPANSION 2025
Sheetx	C-2



20 0 20 40 80

SCALE: 1" = 20'

BASIS OF BEARING AS PER STATE PLANE COORDINATE SYSTEM NAD 83, SOUTH ZONE

LEGEND

×66.18	EXIST. NATURAL GROUND ELEVATION
×TOC=64.92	EXIST. TOP OF CURB ELEVATION
× CL=64.60	EXIST. CENTER LINE ELEVATION
D	EXIST. DRAIN MANHOLE
S	EXIST. SEWER MANHOLE
	EXIST. LIGHT POLE
	EXIST. POWER POLE
	EXIST. GUY WIRE
	EXIST. ROAD SIGN
W	EXIST. WATER METER
EP	EXIST. ELECTRICAL BOX
ET	EXIST. ELECTRIC TRANSFORMER
TP	EXIST. TELEPHONE PEDESTAL
	EXIST. FIRE HYDRANT
WV	EXIST. WATER VALVE
	EXIST. SEWER CLEAN OUT
	EXIST. TREE
	EXIST. CURB INLET
	EXIST. GRATED INLET
— OE —	EXIST. OVERHEAD ELECTRIC
— 6"SS —	EXIST. 6" SANITARY SEWER LINE
— 12"SS —	EXIST. 12" SANITARY SEWER LINE
— 12"D —	EXIST. 12" DRAINAGE LINE
— 48"D —	EXIST. 48" DRAINAGE LINE
— 4"W —	EXIST. 4" WATER LINE
— 8"W —	EXIST. 8" WATER LINE
	EXIST. PAVEMENT
	EXISTING CONCRETE

No.	REVISIONS	BY

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EXISTING SITE, UTILITY, TOPOGRAPHIC AND DEMOLITION LAYOUT

SOUTH TEXAS I.S.D. - MERCEDES

SCI CTE AUTOMOTIVE EXPANSION 2025

MERCEDES , TEXAS

STATE OF TEXAS
JAVIER HINOJOSA
74808
REGISTERED
PROFESSIONAL ENGINEER

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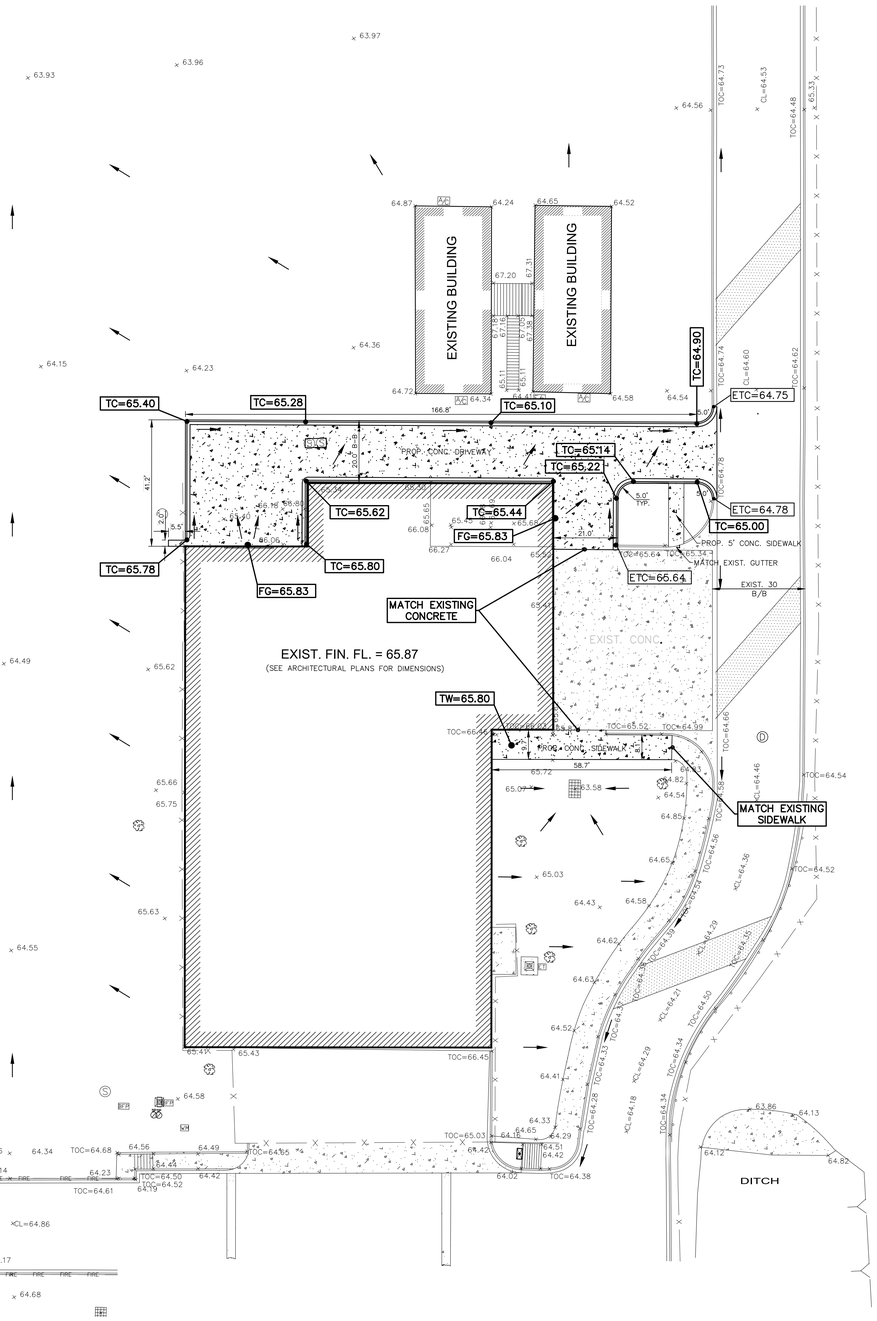
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Project Architect:	David Monreal, AIA
Drawn By:	IO / CM
Job No.	STISD CTE AUTOMOTIVE EXPANSION 2025
Sheetа:	C-3





BASIS OF BEARING AS PER
STATE PLANE COORDINATE SYSTEM
NAD 83, SOUTH ZONE

LEGEND

×66.18	EXIST. NATURAL GROUND ELEVATION
×TOC=64.92	EXIST. TOP OF CURB ELEVATION
×CL=64.60	EXIST. CENTER LINE ELEVATION
	EXIST. CONCRETE
	EXIST. PAVEMENT
	EXIST. CURB & GUTTER
TC=100.00	PROP. TOP OF CURB ELEVATION
ETC=100.00	EXIST. TOP OF CURB
FG=100.00	PROP. FINISH GRADE ELEVATION
FF=100.00	PROP. FINISH FLOOR ELEVATION
TW=100.00	PROP. TOP OF SIDEWALK ELEVATION
	PROP. CURB AND GUTTER
	PROP. LIGHT DUTY CONCRETE DRIVE
	DRAIN FLOW DIRECTION

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PROPOSED GRADIN PLAN

SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES , TEXAS

STATE OF TEXAS
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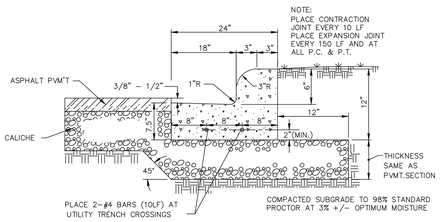
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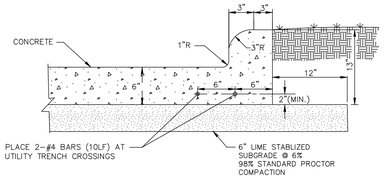
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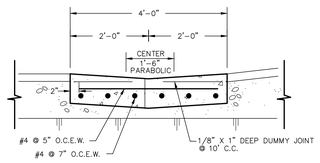
Dates:	03/21/2025
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Sheets:	C-4



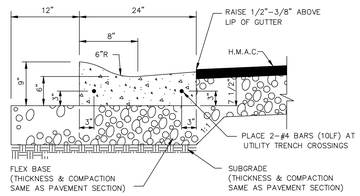
TYPICAL CONCRETE CURB AND GUTTER



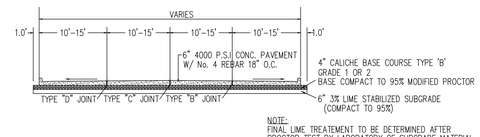
TYPICAL CONCRETE MONOLITHIC CURB

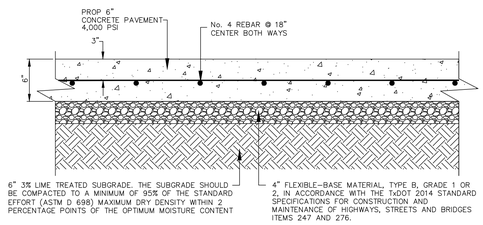


CONCRETE VALLEY GUTTER

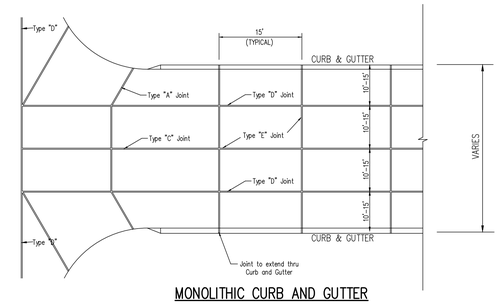


TYPICAL CONCRETE LAYDOWN CURB

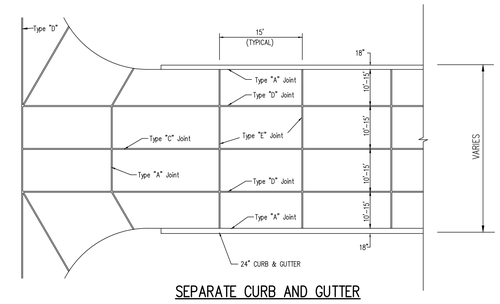




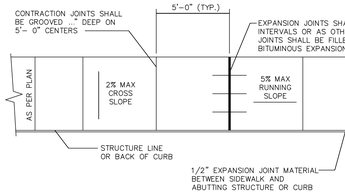
CONCRETE CROSS-SECTION LIGHT DUTY



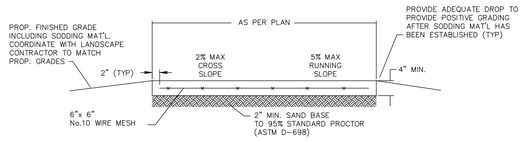
MONOLITHIC CURB AND GUTTER



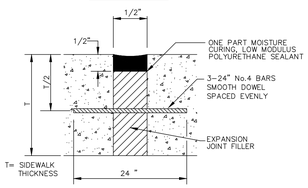
SEPARATE CURB AND GUTTER



PLAN VIEW

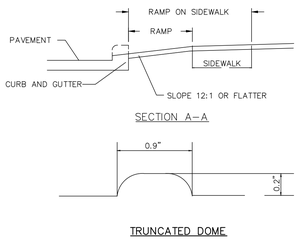


CROSS SECTION



SIDEWALK EXPANSION JOINT

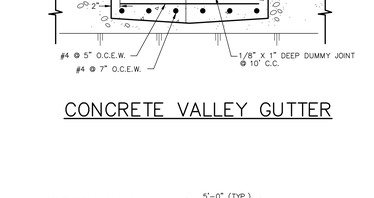
CONCRETE SIDEWALK DETAILS



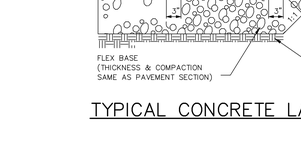
CURB RAMP DETECTABLE WARNING

GENERAL NOTES:

1. PUBLIC SIDEWALK CURB RAMPS SHALL BE CONSTRUCTED IN THE PUBLIC RIGHT OF WAY AT LOCATIONS THAT WILL PROVIDE CONTINUOUS PEDESTRIAN CIRCULATION PATHS TO PEDESTRIAN AREAS, ELEMENTS AND FACILITIES IN THE PUBLIC RIGHT OF WAY AND TO ACCESSIBLE PEDESTRIAN ROUTES ON ADJACENT SITES. CURBED FACILITIES WITH SIDEWALKS AND THOSE WITHOUT SIDEWALKS ARE TO HAVE CURB RAMPS CONSTRUCTED AT ALL STREET INTERSECTIONS AND AT TURNOUTS THAT HAVE CURBED RETURNS. PARTIAL CURB RETURNS SHALL EXTEND TO ACCOMMODATE CURB RAMPS. RAMPS CONSTRUCTED AT LOCATIONS WITHOUT SIDEWALKS SHALL HAVE A LANDING CONSTRUCTED AT THE TOP OF EACH RAMP.
2. THE LOCATION AND ORIENTATION OF CURB RAMPS SHALL BE AS SHOWN IN THE PLANS. CURB RAMP RUNNING SLOPES AT UNRESTRAINED SITES SHALL NOT BE STEEPER THAN 1:12 AND CROSS SLOPE SHALL BE 0.02 OR FLATTER. TRANSITION SLOPES SHALL NOT BE STEEPER THAN 1:12.
3. WHEN ALTERING EXISTING PEDESTRIAN FACILITIES WHERE EXISTING SITE DEVELOPMENT PRECLUDES THE ACCOMMODATION OF A RAMP SLOPE OF 1:12, A RUNNING SLOPE BETWEEN 1:12 AND 1:10 IS PERMITTED FOR A RISE OF 6" MAXIMUM AND A RUNNING SLOPE OF BETWEEN 1:10 AND 1:8 IS PERMITTED FOR A RISE OF 3" MAXIMUM. WHERE COMPLIANCE WITH THE REQUIREMENTS FOR CROSS SLOPE CANNOT BE FULLY MET, THE MINIMUM FEASIBLE CROSS SLOPE SHALL BE PROVIDED. RAMP RUNNING SLOPE IS NOT REQUIRED TO EXCEED 8' IN LENGTH, EXCEPT AT SITES WHERE THE PLANS SPECIFY A GREATER LENGTH.
4. IF A CURB RAMP IS LOCATED WHERE PEDESTRIANS MUST WALK ACROSS THE RAMP, THEN THE WALK SHALL HAVE TRANSITION SLOPES TO THE RAMP; THE MAXIMUM SLOPE OF THE TRANSITIONS SHALL BE 1:12. RAMPS WITH CURB RETURNS MAY BE USED AT LOCATIONS WHERE OTHER IMPROVEMENTS PROVED GUIDANCE AWAY FROM THAT PORTION OF CURB PERPENDICULAR TO THE SIDEWALK; IMPROVEMENTS FOR GUIDANCE ARE NOT REQUIRED AT CURB RAMPS FOR LINEAR PEDESTRIAN TRAFFIC.
5. CURB RAMP DETECTABLE WARNING SURFACES SHALL EXTEND THE FULL WIDTH OF THE RAMP AND IN THE DIRECTION OF TRAVEL 24" FROM THE BACK OF CURB. DETECTABLE WARNING SURFACES SHALL BE CONSTRUCTED BY TEXTURING A TRUNCATED DOME PATTERN IN CONFORMANCE WITH U.S. DEPARTMENT OF JUSTICE A.D.A. STANDARDS FOR ACCESSIBLE DESIGN, A.D.A. ACCESSIBILITY GUIDELINES, SECTION 4.29.2. TRANSITION SLOPES ARE NOT TO HAVE DETECTABLE WARNINGS.
6. UNLESS OTHERWISE CALLED OUT IN THE PLANS, THE RAMP DETECTABLE WARNING SURFACE SHALL BE COLORED IN ACCORDANCE WITH SECTION 351 OF THE STANDARD SPECIFICATIONS.
7. WHERE A CURB RAMP IS CONSTRUCTED WITHIN EXISTING CURB, CURB AND GUTTER AND/OR SIDEWALK, THE EXISTING CURB OR CURB AND GUTTER SHALL BE REMOVED TO THE NEAREST JOINT BEYOND THE CURB TRANSITIONS OR TO THE EXTENT THAT NO REMAINING SECTION OF CURB OR CURB AND GUTTER IS LESS THAN 5' LONG.



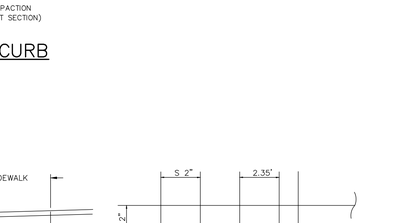
PERPENDICULAR CURB RAMP
TRUNCATED DOME TILES AS PER ADA STANDARDS



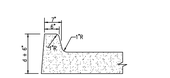
PARALLEL CURB RAMP
TRUNCATED DOME TILES AS PER ADA STANDARDS

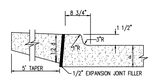
TRUNCATED DOME TILES AS PER ADA STANDARDS

HANDICAP RAMP DEAILS

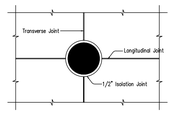


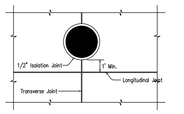
CONCRETE APRON TYPICAL JOINT LAYOUT

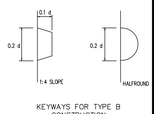




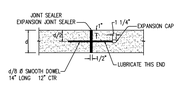
INTEGRAL CURB DETAIL AT DRIVEWAYS



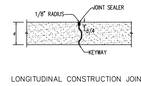




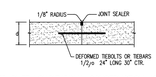
KEYWAYS FOR TYPE B CONSTRUCTION JOINTS



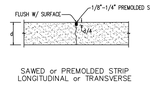
ALTERNATE EXPANSION JOINT
TYPE "A"



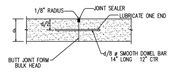
LONGITUDINAL CONSTRUCTION JOINT
TYPE "B"



TIED BUTT LONGITUDINAL CONSTRUCTION JOINT
TYPE "C"

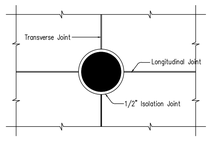


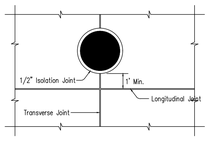
SAWED or PREMOLDED STRIP LONGITUDINAL or TRANSVERSE
TYPE "D"



PLANNED TRANSVERSE CONSTRUCTION JOINT (USED AT NORMAL JOINT SPACING)
TYPE "E"

JOINT DETAILS
N.T.S.





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STANDARD PAVING DETAILS

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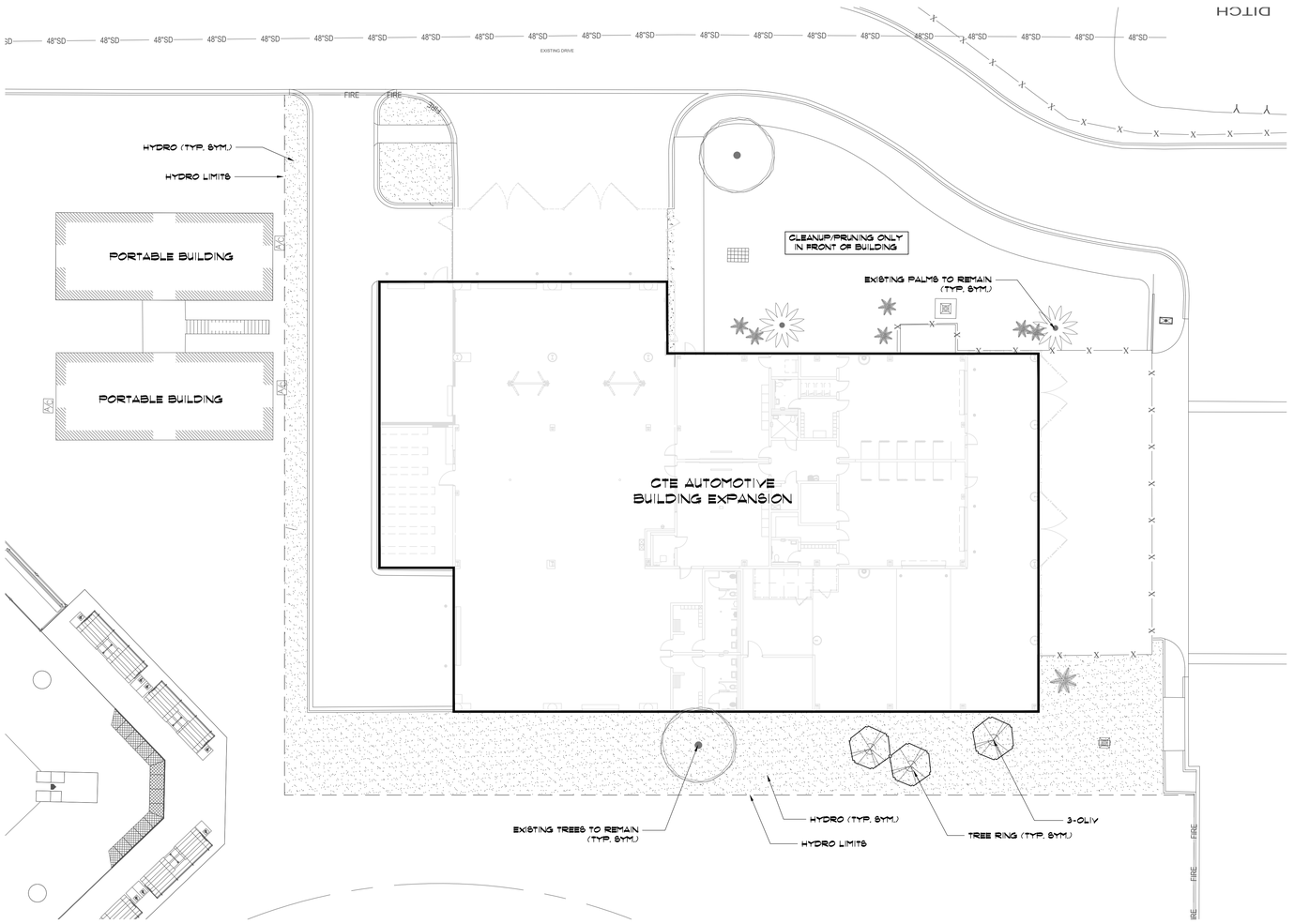
Datea	03/21/2025
Scalea	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	IO / CM
Job No.	STISD CTE AUTOMOTIVE EXPANSION 2025
Sheetx	C-5

STATE OF TEXAS
JAVIER HINOJOSA
74808
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JAVIER HINOJOSA, P.E. 74808 MARCH 21, 2025

811
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javier@javierhinojosaeng.com
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TBPELS FIRM No. F-1295



1 LANDSCAPE PLAN
SCALE: 1" = 16'-0"

NOTES:

1. LANDSCAPE CONTRACTOR TO REMOVE ALL EXISTING CONCRETE EDGING IN LANDSCAPE AREAS
2. LANDSCAPE CONTRACTOR TO CLEAN UP EXISTING LANDSCAPE INCL. TRIMMING, PRUNING AND SHAPING OF TREES, PALMS AND SHRUBS AND RAKING OF ANY DEAD GRASS OR WEED AREAS.
3. LANDSCAPE CONTRACTOR SHALL HYDROMULCH BERMUDA GRASS AS SHOWN AND IN ALL DISTURBED AREAS AND LAYDOWN/STORAGE AREAS.
4. IRRIGATION CONTRACTOR TO INSTALL TEMPORARY IRRIGATION LINES, HEADS, ROTORS TO IRRIGATE HYDROMULCHED AREAS AND NEW TREES. CONNECT TO EXISTING WATER SOURCE AT METER / BACKFLOW
5. LANDSCAPE/IRRIGATION CONTRACTOR TO MAINTAIN LANDSCAPE & IRRIGATION FOR 90 DAYS AFTER NOTICE OF SUBSTATIAL COMPLETION.

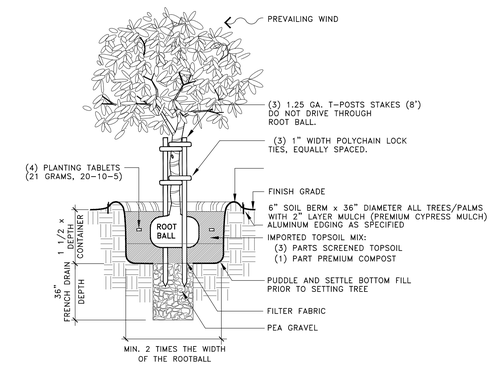
PLANT SCHEDULE

CODE	BOTANICAL NAME	COMMON NAME	TYPE	SIZE	SPACING	QTY
	TREES					
OLIV	CORDIA BOISSIERI	WILD OLIVE	B/B	2-3" CAL.	AS.	3
	GRASS					
HYDRO	CYNODON DACTYLON	COMMON BERMUDA HYDROMULCH			7,700 S.F.	

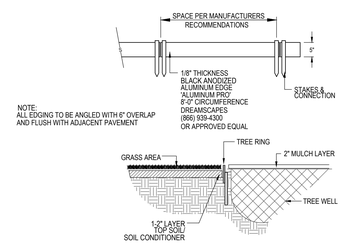
MATERIAL SCHEDULE

DESCRIPTION	NOTES	QUANTITY
HERBICIDE/RAKING	HERBICIDE, RAKING/PREP FOR HYDRO	7,700 S.F.
ORGANIC TOPSOIL	2 BAG PER TREE- ORGANIC TOPSOIL	6 BAGS (2 C.F.)
PREMIUM COMPOST*	1 BAG PER TREE- PREMIUM COMPOST	3 BAGS (2 C.F.)
MULCH (HARDWOOD)	2 BAGS PER TREE IN WATERING BASIN- TEXAS NATIVES HARDWOOD	6 BAGS (2 C.F.)
FERTILIZER	ALL PLANT MATERIAL PER DETAILS	-
PLANTING TABLETS	PER DETAILS / AS SPECIFIED	-
GUYING / STAKING	ALL TREES/PALMS PER DETAILS	3
TREE RINGS	5" BLACK ANODIZED COMMERCIAL GRADE ALUMINUM EDGE PER PLANS/DETAILS	3

* CUTTING EDGE PREMIUM QUALITY COMPOST - HOME DEPOT OR APPROVED EQUAL



2 TREE PLANTING DETAIL
NOT TO SCALE



3 TREE RING DETAIL
NOT TO SCALE

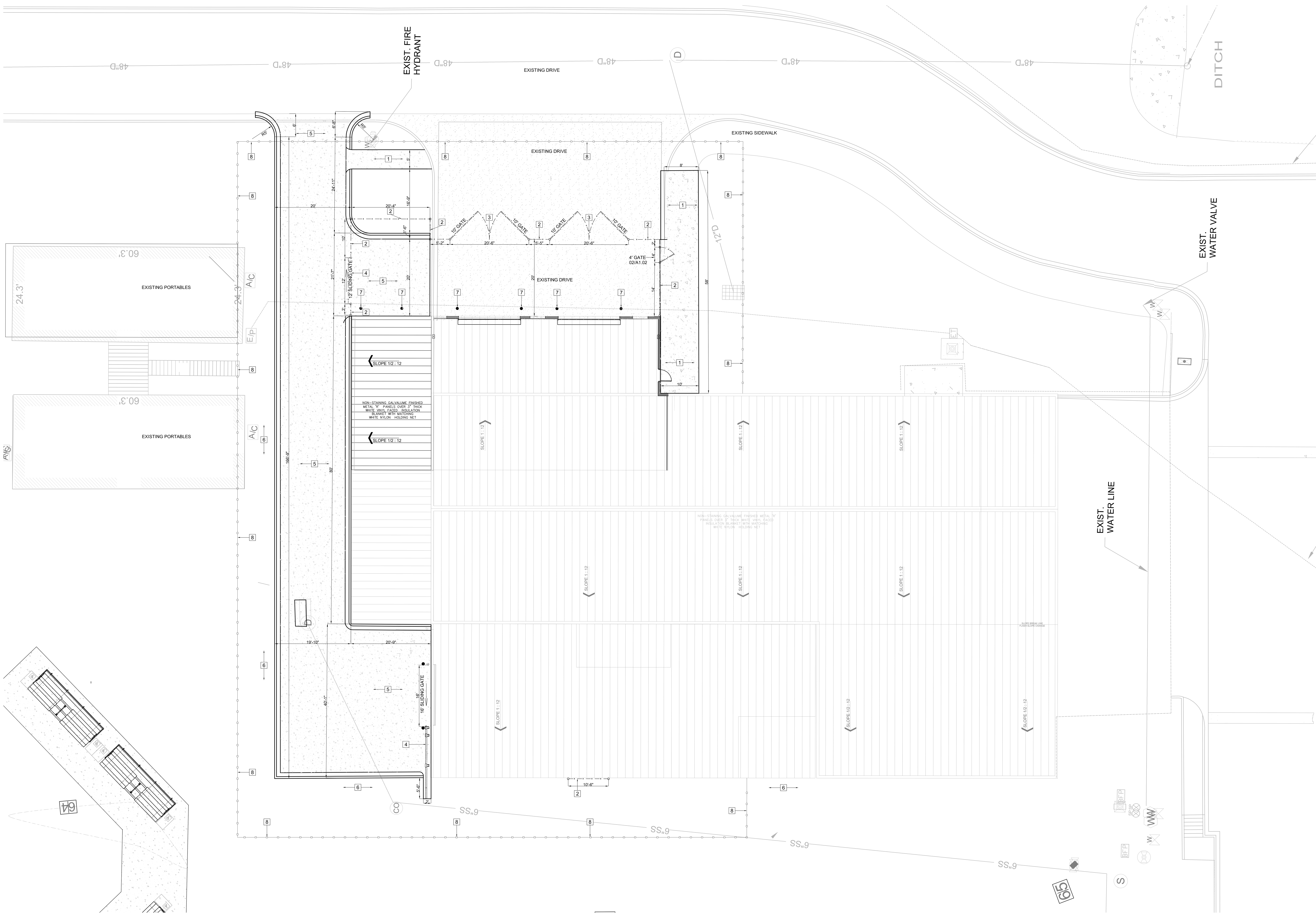
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Project Architect: David Monreal, AIA
Drawn By:
Job No. STISD
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01 PROPOSED SITE PLAN

SCALE: 1" = 10'-0"

PLAN NORTH   TRUE NORTH

SITE NOTES:

1.) FINISH GRADE TO BE 6" BELOW FINISH FLOOR ELEVATION SLOPE AWAY FROM ALL IMPROVEMENTS AT A RATE OF 1/4" PER FOOT FOR THE FIRST 10'-0"; THEN AT A RATE OF 1/8" PER FOOT FOR THE NEXT 20'-0"

2.) SIDE WALK SLOPE IS NOT TO EXCEED 1:20 WITH A CROSS SLOPE OF 1:50 AT ANY INSTANCE.

3.) REFER TO CIVIL, AND MEP DRAWINGS FOR ADDITIONAL WORK TO BE PERFORMED UNDER THIS CONTRACT.

4.) AT ALL ENTRIES OF NEW BUILDINGS WARP CONCRETE SIDEWALKS SO AS TO PROVIDE A FLAT SURFACE WITH FINISHED FLOOR.

5.) REFER TO CIVIL DRAWING DIMENSIONAL PLAN FOR PROPOSED DIMENSIONS.

SITE PLAN KEYED NOTES

1. CONCRETE WALK REFER TO DETAILS 04, 05 & 06 ON SHEET A1.02
2. 6' HIGH GREEN VINYL COATED CHAIN-LINK FENCE REFER TO 01/A1.02
3. 6' HIGH DOUBLE GATES REFERENCE 08/A1.02
4. 6' HIGH GREEN VINYL COATED SLIDING GATE WITH LOCKING MECHANISM REFER TO DETAIL 10 ON SHEET A1.02
5. CONCRETE PAVING WITH CONCRETE CURB AND GUTTER. REFER TO CIVIL FOR ADDITIONAL INFORMATION.
6. REFERENCE LANDSCAPE DRAWINGS FOR LANDSCAPE REQUIREMENTS
7. 8" DIA 48" HIGH CONCRETE BOLLARDS REFERENCE 07/A1.02
8. 6' HIGH TEMPORARY CONSTRUCTION FENCE WITH WIND SCREEN

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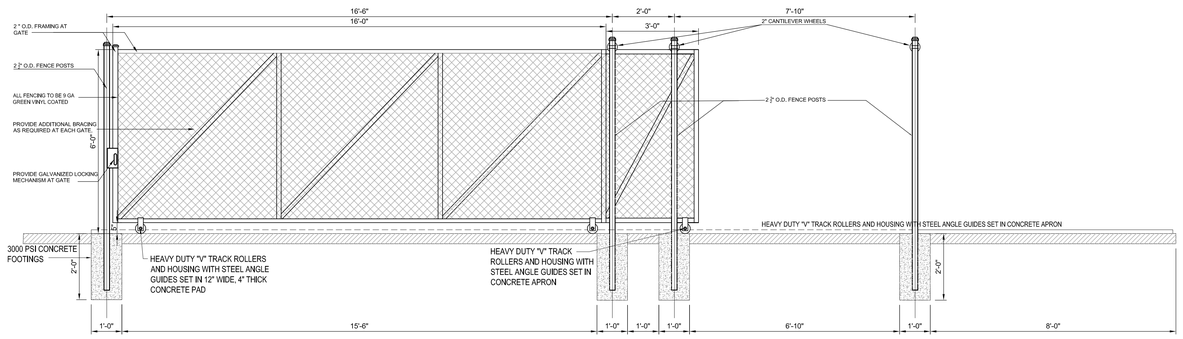
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REGISTERED ARCHITECT DAVID A. MONREAL 19556 STATE OF TEXAS
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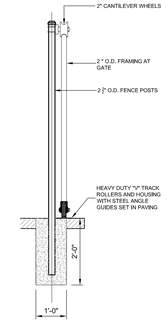
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10 SLIDING GATE DETAIL

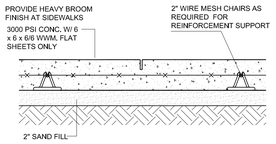
SCALE: 1/2"=1'-0"



09 SLIDING GATE SECTION

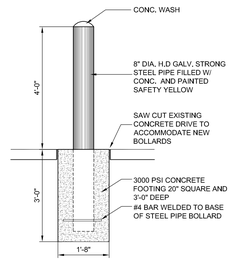
SCALE: 1/2"=1'-0"

1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.



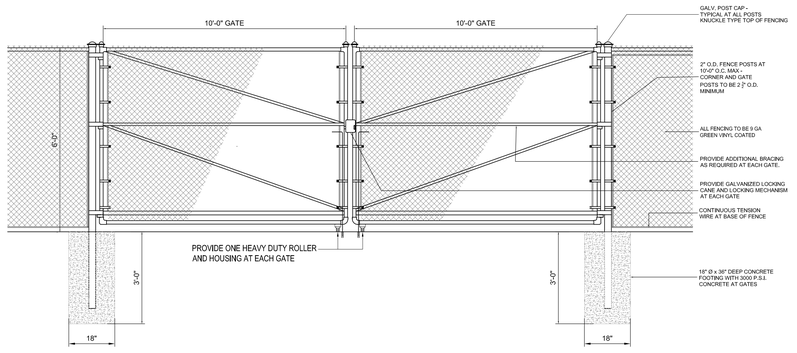
06 SIDEWALK CONTROL JT.

SCALE: 1-1/2"=1'-0" SPACED AT 5'-0" MAX



07 PIPE BOLLARD DETAIL

SCALE: 1/2"=1'-0"

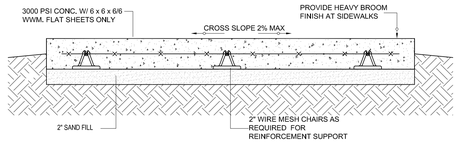


08 DOUBLE SWINGING GATE ELEVATION

SCALE: 1/2"=1'-0"

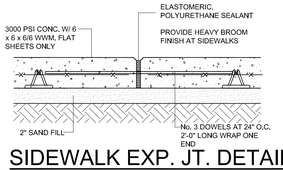
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

SCALE: NTS



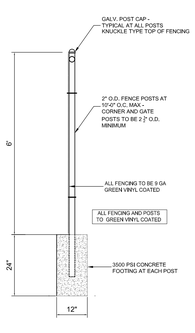
05 SIDEWALK DETAIL

SCALE: 1-1/2" = 1'-0"



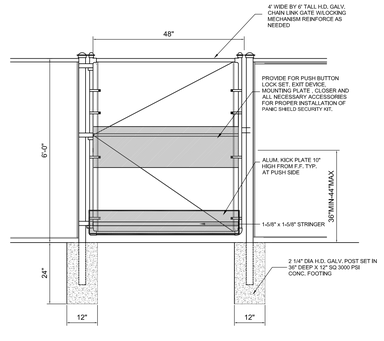
04 SIDEWALK EXP. JT. DETAIL

SCALE: 1-1/2"=1'-0" SPACED AT 20' MAX



03 FENCE SECTION

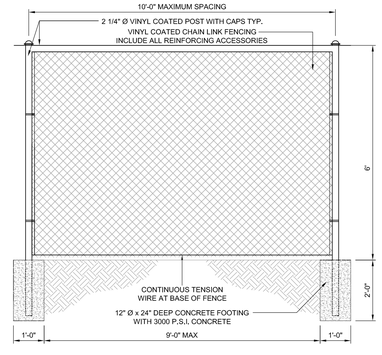
SCALE: 1/2"=1'-0"



02 SWINGING GATE ELEVATION

1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. ALL DIMENSIONS ARE CONSIDERED TRUE AND REFLECT MANUFACTURER'S SPECIFICATIONS.

SCALE: 1/2"=1'-0"



01 FENCE ELVETION ELEVATION

SCALE: 1/2"=1'-0"

1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

SCALE: NTS

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MERCEDES , TEXAS

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Job No. 57550 CTE AUTOMOTIVE EXPANSION 2025
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A1.02

GENERAL DEMOLITION NOTES:

A. GENERAL CONTRACTOR TO TAKE CARE NOT TO DAMAGE EXISTING FOUNDATION, STRUCTURAL STEEL BEAMS / COLUMNS, SURROUNDING BUILDINGS AND VARIOUS SURFACES OUTSIDE OF DEMOLITION AREA. SHOULD ANY DAMAGE OCCUR OUTSIDE OF DEMOLITION AREA, THE GENERAL CONTRACTOR WILL BE RESPONSIBLE TO REPAIR OR REPLACE DAMAGED ITEMS.

B. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING DEBRIS & MATERIAL AWAY FROM SITE ACCORDING TO LOCAL & STATE REGULATIONS.

C. PATCH TO MATCH ALL FINISHES DISTURBED BY THE DEMOLITION AND IMPROVEMENTS.

D. REFER TO SHEET A2.01 FOR PROPOSED FLOOR PLAN.

E. REFER TO STRUCTURAL AND MEP DOCUMENTS FOR ADDITIONAL WORK TO BE PERFORMED IN THESE AREAS.

F. PRE BID - GENERAL CONTRACTOR IS TO BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH THIS PROJECT SITE AND INCLUDE IN BID ALL NECESSARY DEMOLITION REQUIRED FOR IMPROVEMENTS, WHETHER NOTED OR NOT.

G. PRE BID - GENERAL CONTRACTOR IS TO BE RESPONSIBLE FOR NOTIFYING ARCHITECTS OFFICE WITH AN RFI IN THE CASE DISCREPANCIES WITH PLANS AND EXISTING CONDITIONS ARE PRESENT.

H. ALL DEMOLISHED MATERIAL IS TO BE REMOVED FROM PROJECT SITE AND DISPOSED OF ACCORDING TO LOCAL & STATE REGULATIONS PRIOR TO COMMENCING NEW CONSTRUCTION.

I. AT ROOMS & AREAS WHERE NO WORK IS SCHEDULED FOR DEMOLITION GENERAL CONTRACTOR TO PROTECT AREAS FROM DUST, DEBRIS & WORK ETC.

J. IT IS RECOMMENDED THAT PHOTOS OF BOTH INTERIOR AND EXTERIOR OF THE PROJECT BE TAKEN TO SHOW EXISTING CONDITIONS.

K. OWNER TO REMOVE ALL WALL ACCESSORIES THAT ARE NOT TO BE DEMOLISHED.

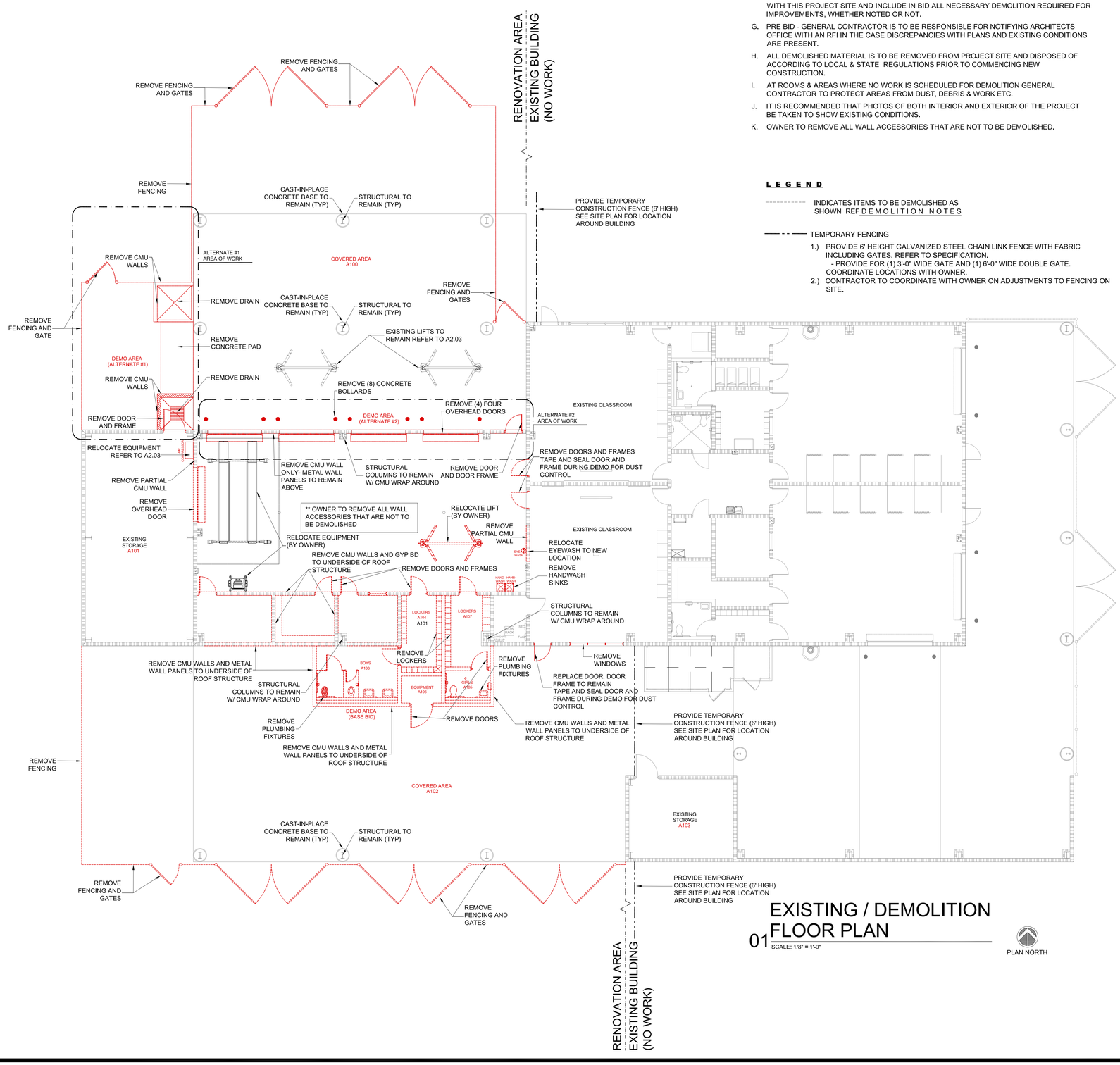
LEGEND

INDICATES ITEMS TO BE DEMOLISHED AS SHOWN REF DEMOLITION NOTES

TEMPORARY FENCING

1.) PROVIDE 6' HEIGHT GALVANIZED STEEL CHAIN LINK FENCE WITH FABRIC INCLUDING GATES. REFER TO SPECIFICATION.
- PROVIDE FOR (1) 3'-0" WIDE GATE AND (1) 6'-0" WIDE DOUBLE GATE. COORDINATE LOCATIONS WITH OWNER.

2.) CONTRACTOR TO COORDINATE WITH OWNER ON ADJUSTMENTS TO FENCING ON SITE.



01 EXISTING / DEMOLITION FLOOR PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

No.	REVISIONS	BY

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EXISTING / DEMOLITION FLOOR PLAN

SOUTH TEXAS I.S.D. - MERCEDES

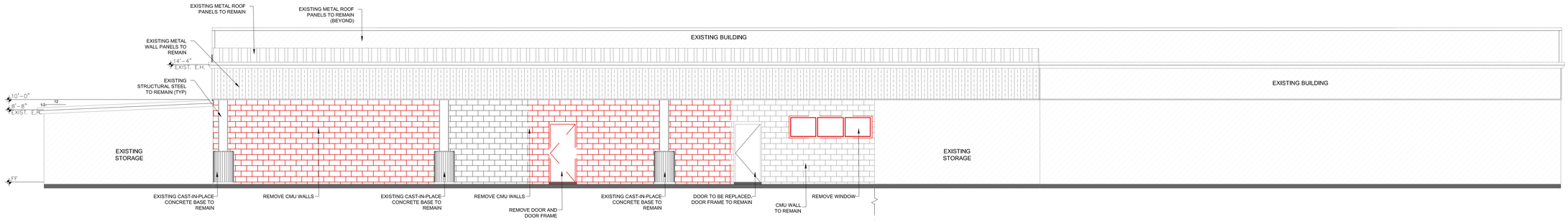
SCI CTE AUTOMOTIVE EXPANSION 2025

MERCEDES , TEXAS

REGISTERED ARCHITECT
DAVID A. MONREAL
19556
STATE OF TEXAS
03/21/2025

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Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: IO / CM
Job No.: STISD CTE AUTOMOTIVE EXPANSION 2025
Sheet: D2.01

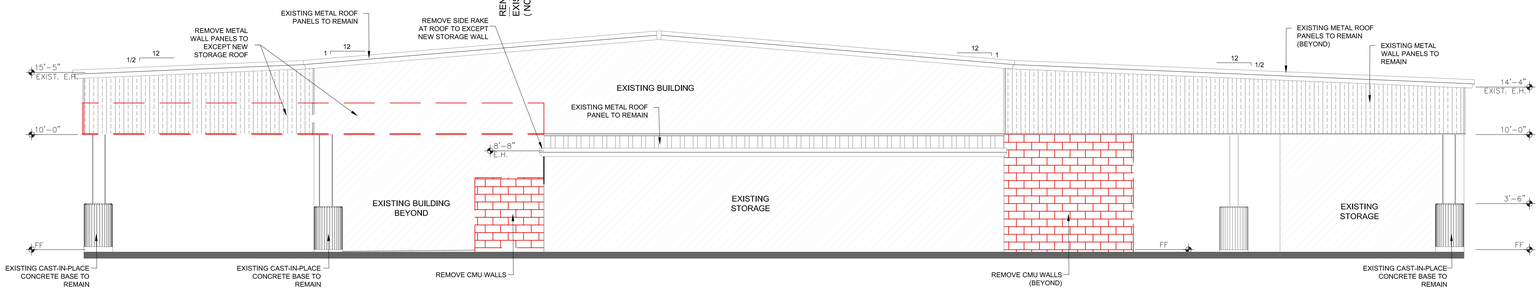


01 EXISTING / DEMOLITION EXTERIOR ELEVATION - SOUTH

SCALE: 3/16" = 1'-0"

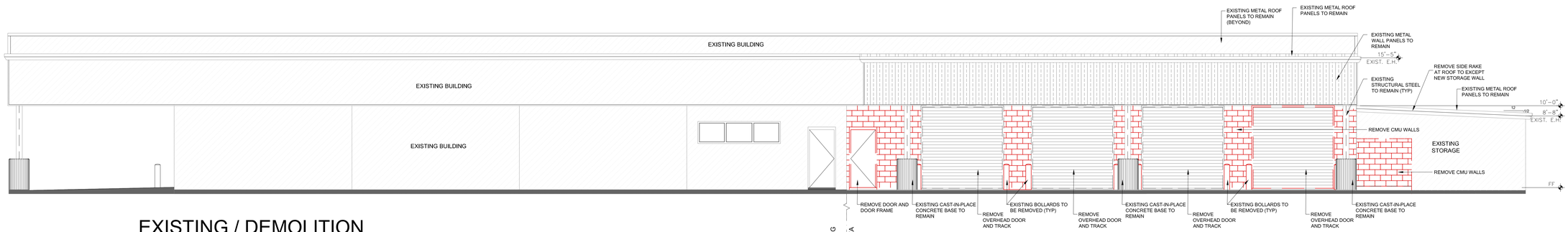
DEMOLITION OF WORK

DEMOLITION OF CMU WALLS



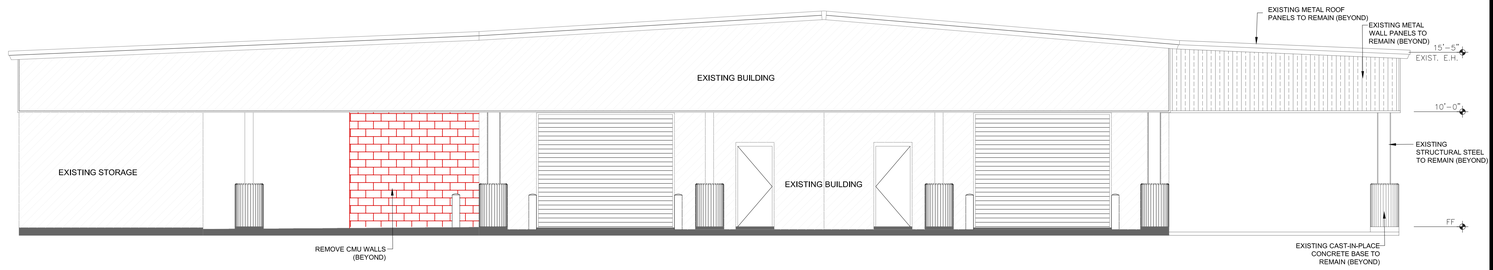
02 EXISTING / DEMOLITION EXTERIOR ELEVATION - WEST

SCALE: 3/16" = 1'-0"



03 EXISTING / DEMOLITION EXTERIOR ELEVATION - NORTH

SCALE: 3/16" = 1'-0"



04 EXISTING / DEMOLITION EXTERIOR ELEVATION - EAST

SCALE: 3/16" = 1'-0"

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EXISTING / DEMOLITION EXTERIOR ELEVATIONS

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NOTE:
ALL GYPSUM BOARD TO BE **PAINTED** WHETHER NOTED OR NOT

ROOM FINISH SCHEDULE

THIS SCHEDULE BASED ON PLAN NORTH ORIENTATION

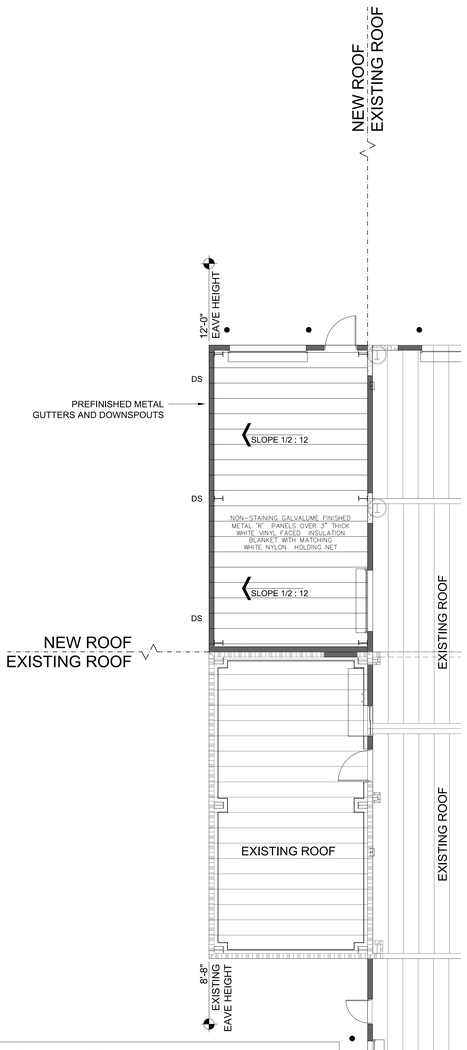
ROOM	ROOM NAME	BASE	FLR.	WALLS N	WALLS S	WALLS E	WALLS W	CLG.	CLG. HEIGHTS	REMARKS
A100	AUTOMOTIVE AREA (ALT #2)		EPOXY	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	EXP/PTD	VARIES	
A101	EXISTING STORAGE	RUBBER	EPOXY	GB|PTD	GB|PTD	GB|PTD	GB|PTD	EXP/PTD	VARIES	PAINT ALL EXIST. 'RED' STEEL STRUCTURE, SUPPORT STEEL, PURLINS AND UNISTRUTS ON WALL AND ROOF TO 'GREEN' (COLOR CHOSEN BY ARCHITECT)
A102	AUTOMOTIVE AREA		EPOXY	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	EXP/PTD	VARIES	
A103	EXISTING STORAGE									
A104	AUTOMOTIVE AREA		EPOXY	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	EXP/PTD	VARIES	PAINT ALL EXIST. 'RED' STEEL STRUCTURE, SUPPORT STEEL, PURLINS AND UNISTRUTS ON WALL AND ROOF TO 'GREEN' (COLOR CHOSEN BY ARCHITECT)
A105	BOYS PERSONAL STORAGE		C.T.	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	S.A.C.	9'-0"	
A106	BOYS RESTROOM	C.T.	C.T.	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	S.A.C.	9'-0"	6'-8" C.T. WAINSCOT / COVE BASE
A107	GIRLS PERSONAL STORAGE		C.T.	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	S.A.C.	9'-0"	
A108	GIRLS RESTROOM	C.T.	C.T.	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	S.A.C.	9'-0"	6'-8" C.T. WAINSCOT / COVE BASE
A115	STORAGE (ALT #1)		EPOXY	CMU|PTD	CMU|PTD	CMU|PTD	CMU|PTD	S.A.C.	VARIES	

FINISH LEGEND:

CONC.	SEALED CONCRETE	EPOXY	EPOXY
C.T.	CERAMIC TILE	EXP/PTD	EXPOSED PAINTED
GB/PTD	GYPSUM BOARD PAINTED	S.A.C.	SUSPENDED ACOUSTICAL CEILING REFERENCE SPECIFICATIONS FOR TYPES
CMU/PTD	CONCRETE MASONRY UNIT PAINTED	MTL	METAL PANEL
PTD.	PAINTED		
RUBBER	RUBBER BASE		

WALL TYPE LEGEND

- NEW 8" CMU WALLS - UNLESS OTHERWISE NOTED.
- NEW 8" CONCRETE WALL - REFER TO STRUCTURAL
- NEW FURROUT WALL WITH METAL STUDS (AS NOTED ON PLAN) AND 5/8" TYPE 'X' FIRE RATED, HIGH IMPACT GYP.BD. TO ROOF DECK OVER EXISTING CMU WALL



GENERAL ROOF NOTES:

1.) ALL PENETRATIONS SHALL BE COORDINATED WITH MECHANICAL SUBCONTRACTOR AND SHALL BE PERFORMED BY THE METAL BUILDING ROOFING SUBCONTRACTOR

2.) ALL ROOF PENETRATIONS SHALL BE COORDINATED WITH MECHANICAL / ELECTRICAL SUBCONTRACTOR AND THE METAL BUILDING ROOFING SUBCONTRACTOR

3.) PROVIDE PRE-MANUFACTURED CONCRETE SPLASH BLOCKS AT EACH ROOF DOWN SPOUT LOCATION AND OR AT EACH ROOF DRAIN NOZZLE OUTLET. SECURE SPLASH BLOCKS TO EITHER GROUND OR BUILDING

4.) COORDINATE ALL DOWN SPOUT LOCATIONS SO AS TO ASSURE THAT NO DOWN SPOUTS ARE LOCATED OVER DOOR / WINDOW OPENINGS OR OTHER KEY BUILDING ELEMENTS

5.) CONTRACTOR TO PROVIDE AND COORDINATE ALL PIPING & ACCESSORIES WITH MEP ENGINEERS PRIOR TO COMMENCING ANY ROOF DRAINAGE PIPING

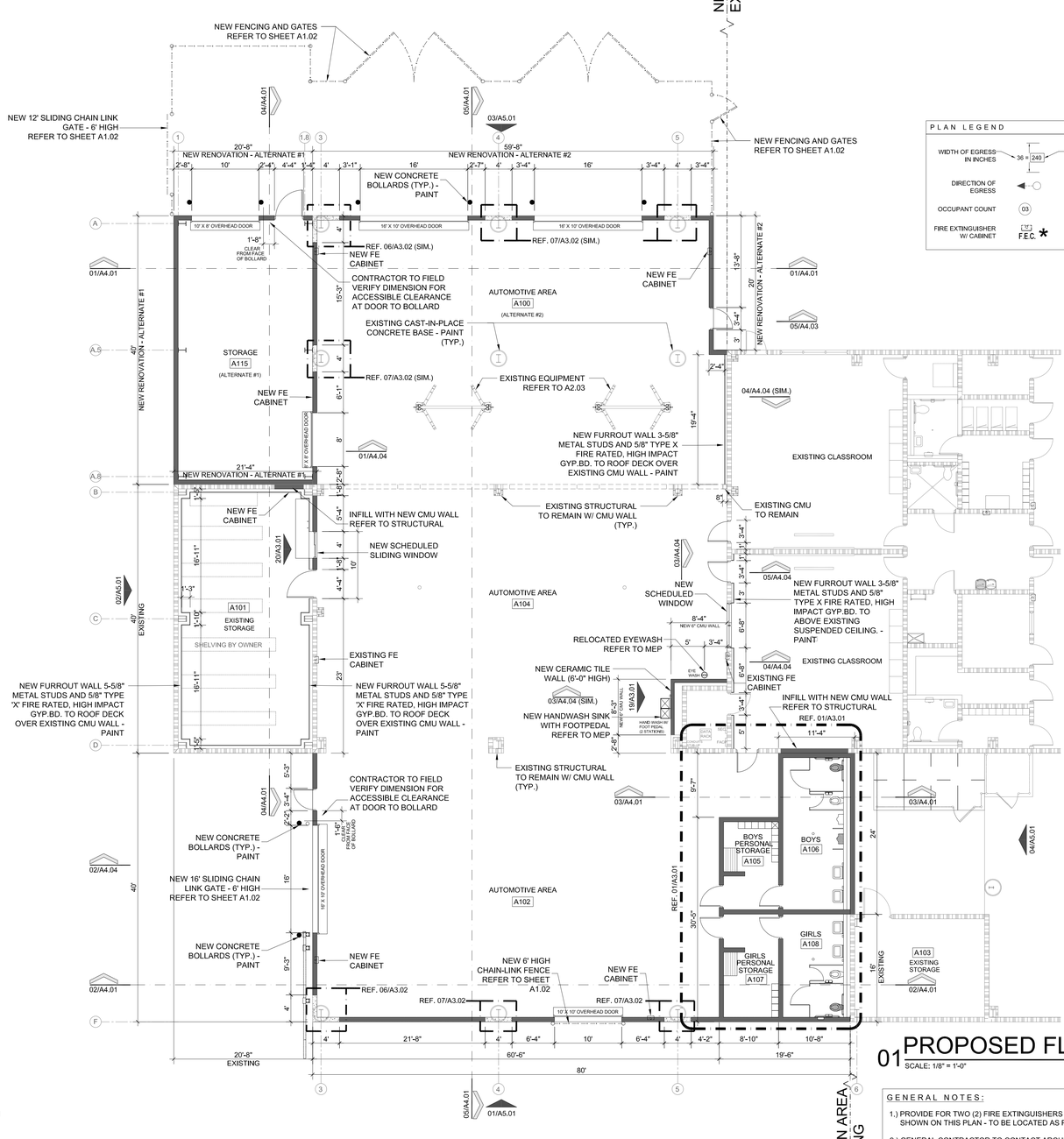
6.) PROVIDE POSITIVE DRAINAGE IN AND AROUND ALL ROOF TOP EQUIPMENT

7.) CONTRACTOR ALL ROOF EXPANSION JOINTS WITH STRUCTURAL ENGINEERS ROOF FRAMING PLANS

8.) REFER TO WALL SECTIONS (A4.00 SERIES) FOR ADDITIONAL ROOF NOTES

02 PARTIAL ROOF PLAN

SCALE: 1/8" = 1'-0" ALTERNATE #1 PLAN NORTH



01 PROPOSED FLOOR PLAN

SCALE: 1/8" = 1'-0" PLAN NORTH

GENERAL NOTES:

1.) PROVIDE FOR TWO (2) FIRE EXTINGUISHERS AND CABINETS IN ADDITION TO THOSE SHOWN ON THIS PLAN - TO BE LOCATED AS PER ARCHITECT'S OFFICE.

2.) GENERAL CONTRACTOR TO CONTACT ARCHITECTS OFFICE IF ANY FLOOR TILE DESIGN IS UNCLEAR REGARDING SIZE, COLOR, OR LOCATION

3.) PROVIDE TRANSITION STRIPS AT ALL DISSIMILAR FLOOR CONDITIONS

4.) REFERENCE ROOM FINISH SCHEDULE ON SHEET A2.01 FOR ROOM FINISH INFORMATION AND SHEET A2.04 FOR COLOR SELECTIONS

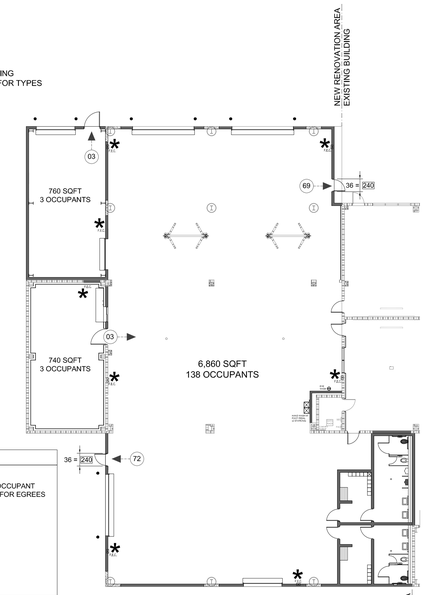
5.) REFERENCE FIXTURE PLAN ON SHEET A2.02 FOR FIXTURE ACCESSORY REQUIREMENTS.

6.) REFERENCE SHEET A3.01 FOR TOILET ENLARGEMENTS.

7.) REFERENCE SHEETS A4.00 SERIES FOR WALL SECTIONS NOTED ON THIS PLAN.

PLAN LEGEND

- WIDTH OF EGRESS IN INCHES — 36 = 240 — MAX OCCUPANT LOAD FOR EGRESS
- DIRECTION OF EGRESS
- OCCUPANT COUNT — 03
- FIRE EXTINGUISHER W/ CABINET — 1A 10BC F.E.C.



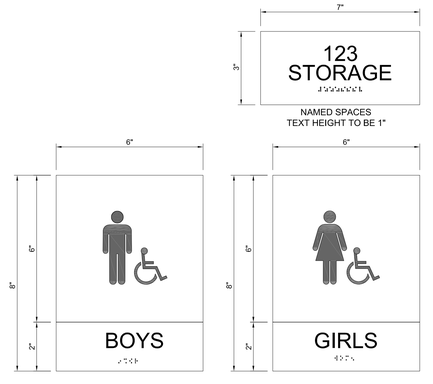
04 EGRESS PLAN

SCALE: 1/16" = 1'-0" 8,360 SQFT = RENOVATED AREA 144 TOTAL OCCUPANTS PLAN NORTH

APPLICABLE CODES
- 2018 IBC, 2018 IPC, 2018 IMC, 2018 IFC, 2017 NEC, 2018 INTERNATIONAL ENERGY CONSERVATION CODE, CITY OF MERCEDES ZONING & CODE ORDINANCE

CHAPTER 3 USE AND OCCUPANCY CLASSIFICATION
- THE MAIN OCCUPANCY OF THE BUILDING IS EDUCATIONAL GROUP E

CHAPTER 9 FIRE PROTECTION SYSTEM
- AUTOMATIC SPRINKLER SYSTEM SHALL NOT BE PROVIDED FOR BUILDING



RESTROOMS: RECEIVE MALE SYMBOL AND INTERNATIONAL ACCESSIBILITY SYMBOL

RESTROOMS: RECEIVE FEMALE SYMBOL AND INTERNATIONAL ACCESSIBILITY SYMBOL

03 ROOM SIGNAGE TEMPLATE

SCALE: NTS

No.	REVISIONS	BY

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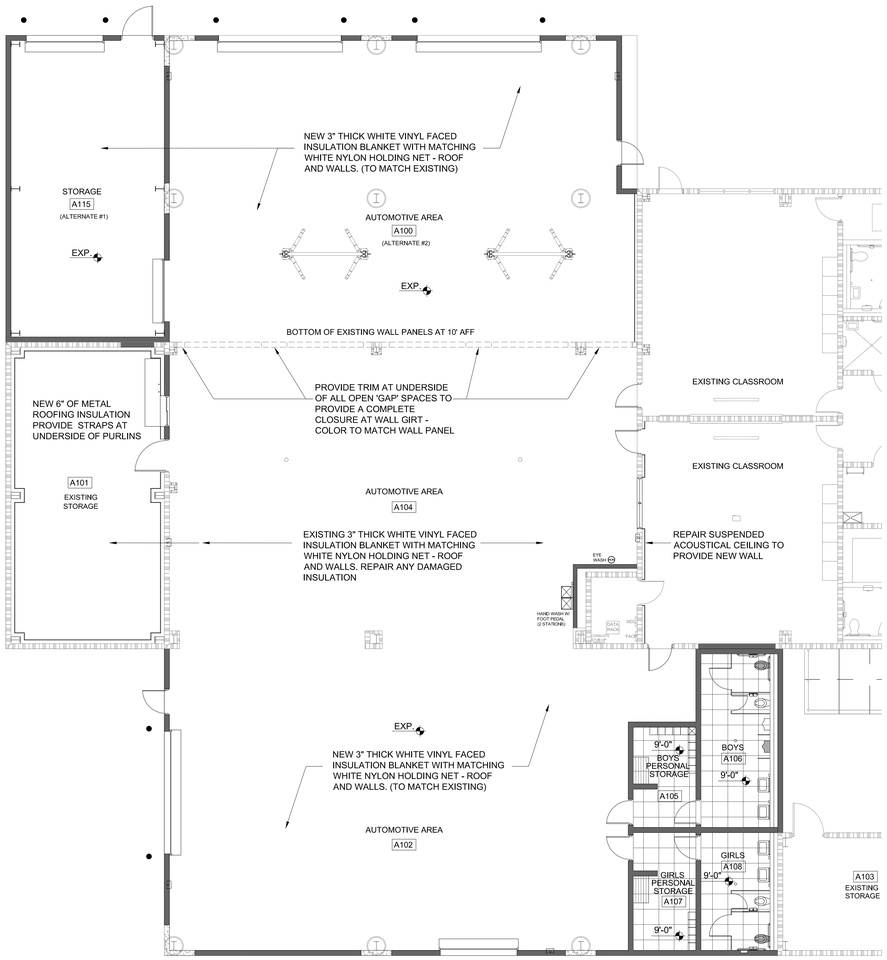
MERCEDES , TEXAS

PROPOSED FLOOR PLAN, ROOF PLAN, EGRESS PLAN AND SCHEDULE



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Drawn By: IO / CM
Job No.: STISD CTE AUTOMOTIVE EXPANSION 2025
Sheet: A2.01

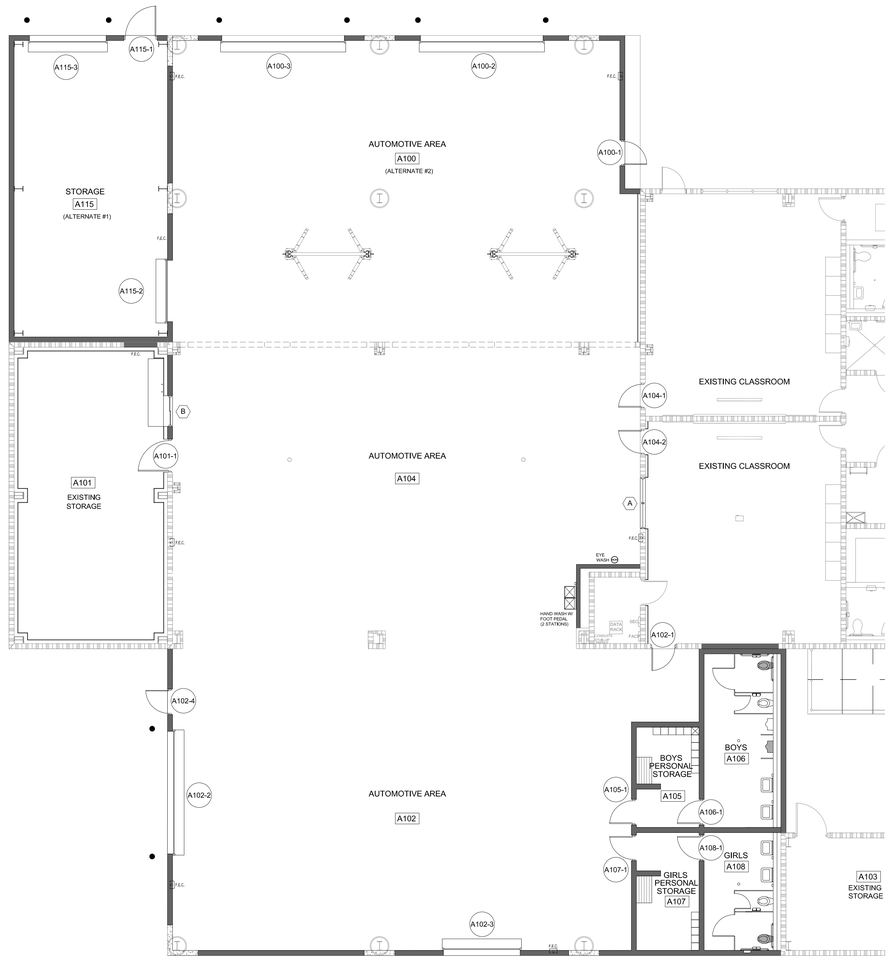


02 REFLECTIVE CEILING PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

24" X 24" SUSPENDED ACOUSTICAL CEILING
REFER TO SPECIFICATION FOR TYPE



01 FIXTURE PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

DOOR TAG

A100 - 1

ROOM NUMBER

DOOR # TYPE

No.	REVISIONS	BY

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FIXTURE PLAN AND REFLECTIVE CEILING PLAN

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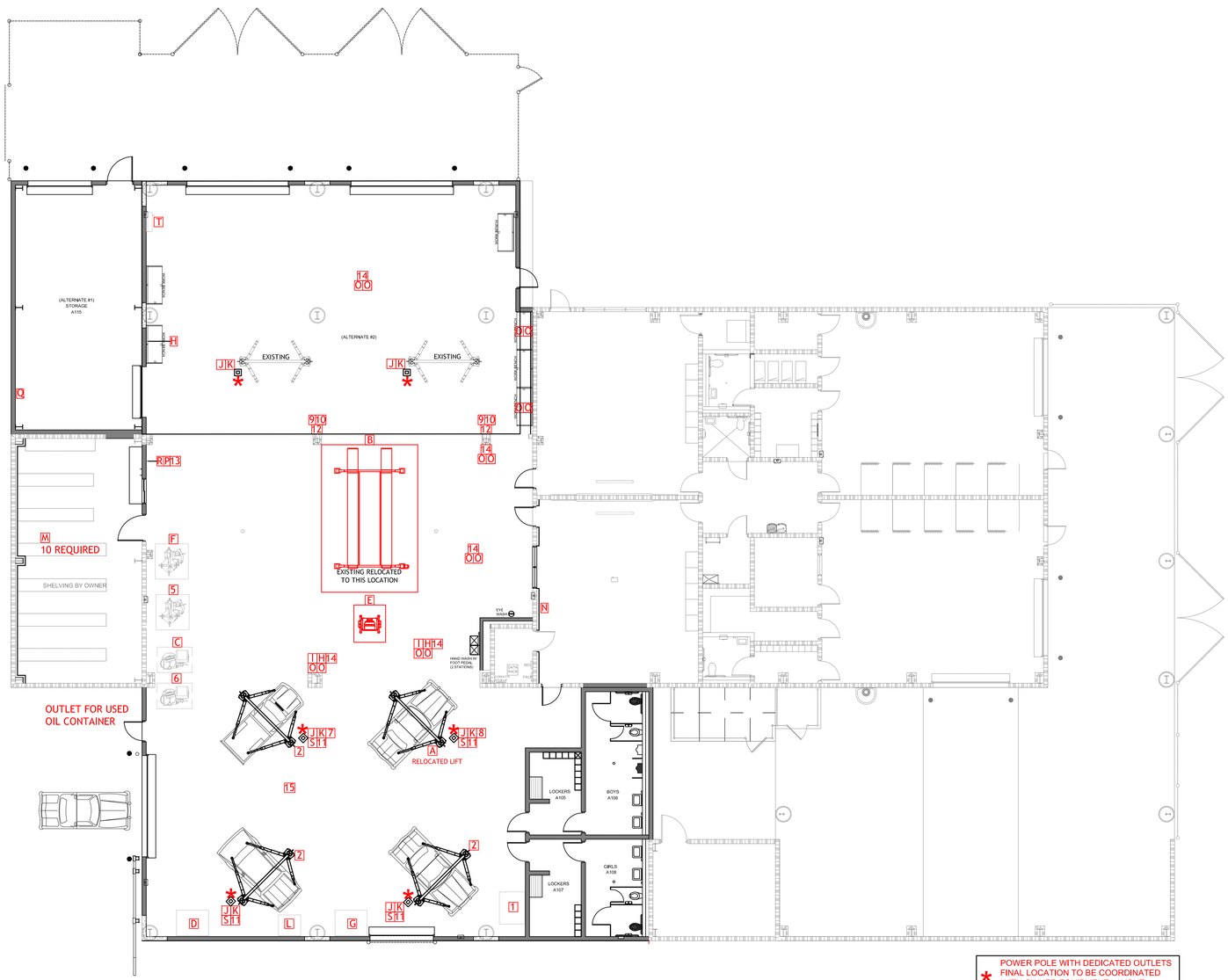
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03/21/2025

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Sheet:

A2.02



SOUTH TEXAS ISD VOCATIONAL BLDG. RENOVATION
PROPOSED FLOOR PLAN

* POWER POLE WITH DEDICATED OUTLETS FINAL LOCATION TO BE COORDINATED WITH OWNER EQUIPMENT LAYOUT. PRE-INSTALLATION MEETING REQUIRED

ALL EQUIPMENT WILL BE INSTALLED AND OR RELOCATED BY THE OWNER

01 EQUIPMENT LAYOUT PLAN

SCALE : 1/8"=1'-0"

NORTH PLAN NORTH

GMS
UPDATED ON 2 26 25

Automotive Energy Needs List

CURRENT SHOP EQUIPMENT					
Item			Voltage	AMPS	Quantity
Rotary 2-Post 10K Asymmetrical Lift	A		240VAC	30	3
Hunter L421 14K Alignment Rack	B		208VAC	20	1
Hunter Wheel Balancer SWT	C		230VAC	3	1
Hunter BL505 Brake lathe	D		120/230VAC	12	1
Coats CWA 6500 Alignment	E		115VAC	15	1
Coats Tire Changer	F		230VAC	15	1
Miller Welder	G		208-575VAC	40	1
Dewalt Bench Top Grinders	H		120VAC	4.2	4
Dewalt Chop Saw	I		120VAC	15	2
Schumacher Battery Chargers	J		120VAC	1A	6
RobinAir Refrigerant Recovery AC service	K		125VAC	12	2
JET Drill Press	L		115VAC	9	1
Milwaukee M12 and M18 Battery Chargers	M		120VAC	30	10
Consulab Electromagnetism Trainer	N		120VAC	1.3	1
Consulab Ohm's law and DC Circuits Trainer	O		120VAC	4	12
Consulab Single Sided Auto Lighting System Trainer	P		120VAC	30	1
Consulink GM 1.4L Engine Trainer	Q		12VDC	800mA	1
CRC Smart Washer	R		115VAC	6.3	1
Ammco Brake Washer	S		115VAC	6.3	1 AIR POWERED (NO CUTSHEET)
CAMspray Pressure Washer	T		120VAC	20	1
NEW ORDERED EQUIPMENT					
Item			Voltage	AMPS	Quantity
ProCut b17 Bomber Brake Lathe		1	90-264VAC	15	1
Challenger 2-Post 10K Adjustable Lift		2	208-230VAC	30	1
~~Challenger 2-Post 12K Adjustable Lift~~		3	208-230VAC	30	1
~~Challenger 2-Post 14k Adjustable Lift~~		4	208-230VAC	30	1
CEMB SM1100 Tire Changer		5	220VAC	20	1
CEMB ER100GT Wheel Balancer		6	220VAC	15	1
ProCut On Car Lathe		7	120V	5.8	1
ProCut ON Car Lathe		8	48V	15.54	1
Mahle Fluid Pro Transmission Fluid Exhanger		9	110V	15	1
Mahle Fluid Pro Coolant Fluid Exhanger		10	110V	15	1 AIR POWERED (NO CUT SHEET)
Mahle Fluid Pro Brake Flush System		11	110V	15	1
Motorvac Power Steering Fluid Exchanger		12	110V	15	1
Consulab Multiptex Network Trainer		13	120VAC/12VDC	15	1 * Trainers that were not in the original list
Consulab Speed and Position Sensors Trainer		14	120VAC	15	4 * Trainers that were not in the original list
Consulab Disc & Drum ABS Brake Trainer - Faults		15	110V	20	1 * Trainers that were not in the original list
Each bay should be able supply electricty and support each one of the following items within each bay at any given time. ((line 43-49)					
Each Bay = Extension Cord Reel with Hand Lamp			120VAC	15	4 Not Ordered, but every bay should be able to equip this
Each Bay = Battery Chargers & Jump Starters			120VAC	1A	4 Not Ordered, but every bay should be able to equip this
Each Bay = Connect OBD-II Scanner			12VDC	1	4 Not Ordered, but every bay should be able to equip this
Each Bay = On-Car Brake Lathe			48-120VAC	20	4 Not Ordered, but every bay should be able to equip this
Each Bay = High-output LED Shop lights			120/277V	15	18 Not Ordered, but every bay should be able to equip this
Each Bay = Fume Extractors & Ventilation Fans			120VAC	1-3A	4 Not Ordered, but every bay should be able to equip this
Each Bay = Refrigerant Recovery A/C Service Machine			125VAC	12	4 Not Ordered, but every bay should be able to equip this
WiFi Router			120VAC	4	1 Not Ordered, but every bay should be able to equip this
Industrial BigAss Fan			240VAC	6	1 Not Ordered, but every bay should be able to equip this

No.	REVISIONS	BY

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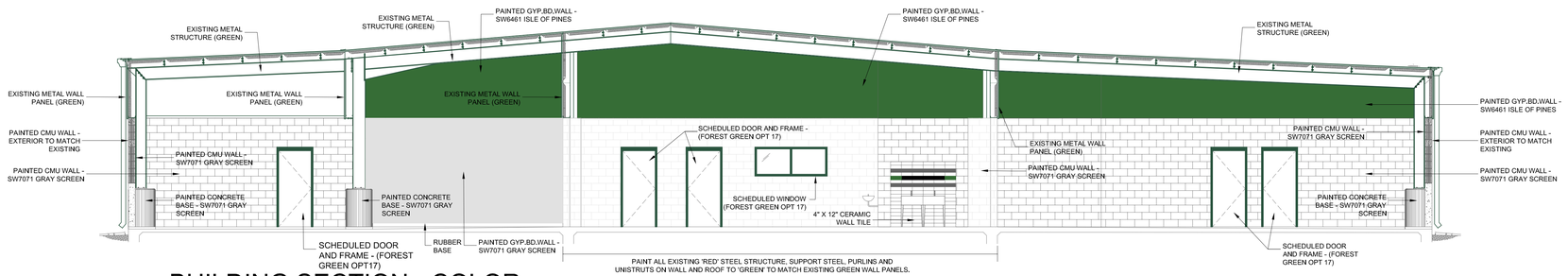
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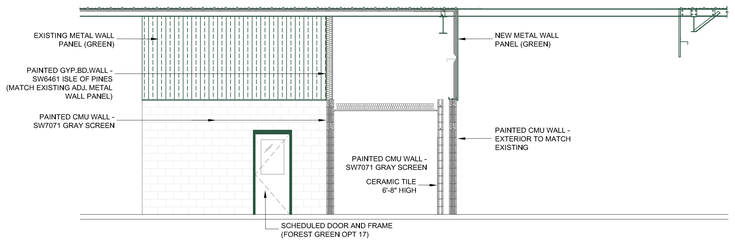
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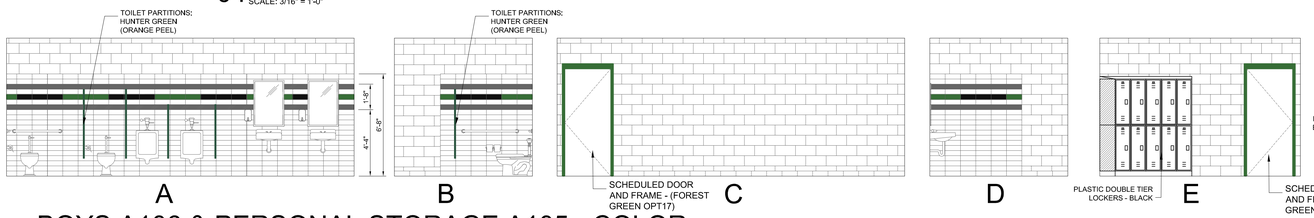
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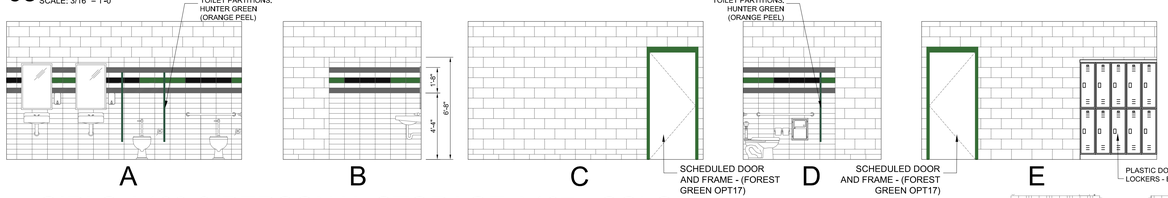
03 BUILDING SECTION - COLOR
SCALE: 3/16" = 1'-0"



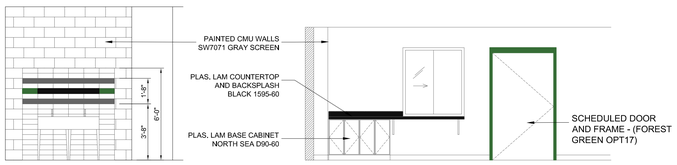
04 BUILDING SECTION - COLOR
SCALE: 3/16" = 1'-0"



05 BOYS A106 & PERSONAL STORAGE A105 - COLOR
SCALE: 3/16" = 1'-0"



06 GIRLS A108 & PERSONAL STORAGE A107 - COLOR
SCALE: 3/16" = 1'-0"

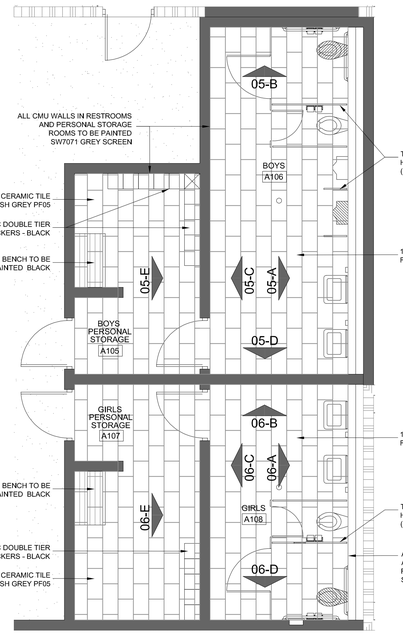


07 HANDWASH STATION
SCALE: 3/16" = 1'-0"

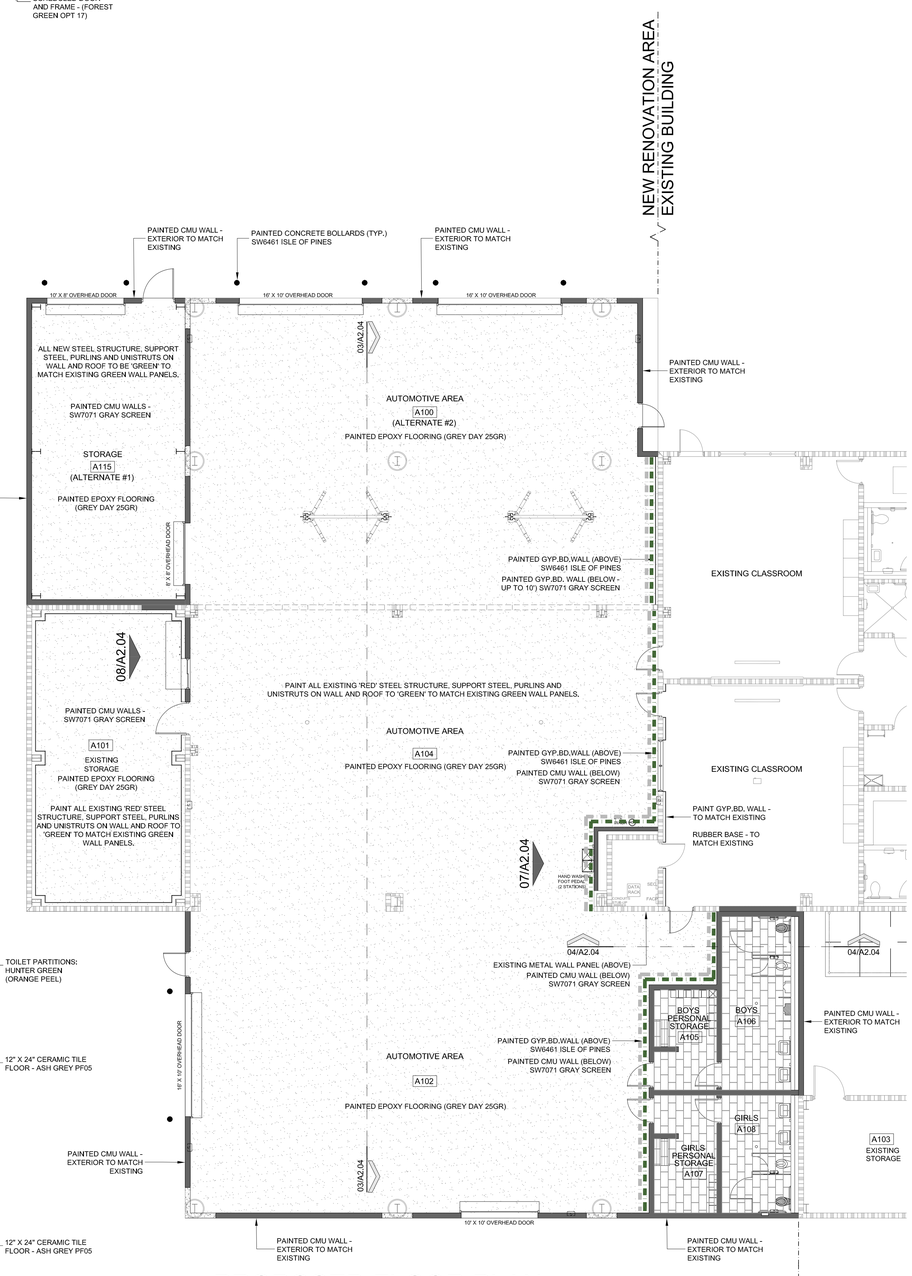
08 EXIST. STORAGE A101
SCALE: 3/16" = 1'-0"

COLOR SELECTION LEGEND

- 4" X 12" CERAMIC WALL TILE ARCTIC WHITE 0190 (FIELD)
- 12" X 24" CERAMIC FLOOR TILE ASH GREY PF05
- 4" X 12" CERAMIC WALL TILE DESERT GRAY X114 (ACCENT)
- PAINTED EPOXY FLOORING GREY DAY 25GR
- 4" X 12" CERAMIC WALL TILE BLACK K111 (ACCENT)
- SW 6461 ISLE OF PINES (ABOVE 10') SW 7071 GRAY SCREEN (BELOW)
- 4" X 12" CERAMIC WALL TILE EMERALD 0115 (ACCENT)



ENLARGED RESTROOM PLAN COLOR SELECTION LAYOUT
02 SCALE: 1/4" = 1'-0"



PROPOSED FLOOR PLAN COLOR SELECTION LAYOUT
01 SCALE: 1/8" = 1'-0"

PLAN NORTH

No.	REVISIONS	BY

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PROPOSED FLOOR PLAN - COLOR SELECTION LAYOUT

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Interior Designers

Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: IO / CM
Job No. 5150
CTE AUTOMOTIVE EXPANSION 2025
Sheet: A2.04

WINDOW SCHEDULE

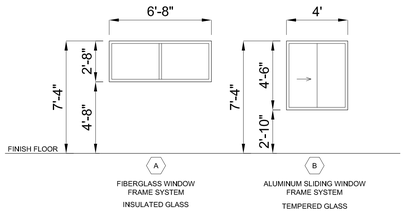
WDW NO.	MATL	SIZE		ELEVATION		GLASS	DETAIL			REMARKS
		W	H	HEAD	SILL		JAMB	HEAD	SILL	
A	FRP	6'-8"	2'-8"	7'-4"	4'-8"	INSULATED				CHEM-PRUF MANUFACTURE
B	ALUM	4'-0"	4'-6"	7'-4"	2'-10"	TEMPERED				

NOTE : PROVIDE LABELED DOORS AND HARDWARE AT ALL FIRE RATED PARTITIONS
NOTE : ALL GIVEN DIMENSIONS OF DOOR LITES ARE VISIBLE GLASS AREA - ACTUAL LIGHT OPENING TO VARY BY MANUFACTURE'S REQUIREMENTS

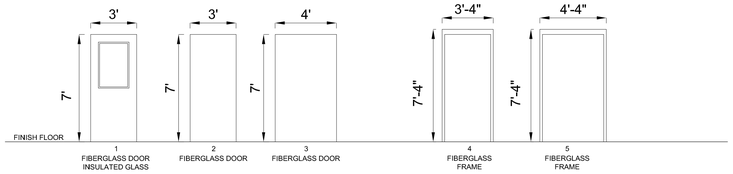
NOTE : REFER TO FIXTURE PLANS FOR CORRESPONDING DOOR HARDWARE SETS
NOTE : PROVIDE CYLINDERS OF ALL LOCKSETS TO BE KEYED TO EXISTING GRANDMASTER SYSTEM.
NOTE : CONTRACTOR MUST PROVIDE TRANSITION STRIPS AT ALL DISSIMILAR FLOOR CONDITIONS BETWEEN ROOMS AT DOOR SILLS

DOOR SCHEDULE

DOOR NO.	DOOR MATL.	DOOR W	DOOR H	DOOR T	DOOR TYP.	FRAME MATL.	FRAME W	FRAME H	FRAME T	FRAME TYP.	HDWR	DETAIL JAMB	DETAIL HEAD	DETAIL SILL	REMARKS
A100-1	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A100-2		16'-0"	10'-0"		9	PER MANUFACTURE									
A100-3		16'-0"	10'-0"		9	PER MANUFACTURE									
A101-1	FRP	4'-0"	7'-0"	1 3/4"	4	FRP	4'-4"	7'-4"	VERIFY	5					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A102-1	FRP	3'-0"	7'-0"	1 3/4"	1	EXISTING									CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A102-2		16'-0"	10'-0"		9	PER MANUFACTURE									
A102-3		10'-0"	10'-0"		8	PER MANUFACTURE									
A102-4	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A104-1	FRP	3'-0"	7'-0"	1 3/4"	1	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A104-2	FRP	3'-0"	7'-0"	1 3/4"	1	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A105-1	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A105-1	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A107-1	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A108-1	FRP	3'-0"	7'-0"	1 3/4"	2	FRP	3'-4"	7'-4"	VERIFY	4					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A115-1	FRP	4'-0"	7'-0"	1 3/4"	3	FRP	4'-4"	7'-4"	VERIFY	5					CHEM-PRUF MANUFACTURE / KICKPLATE ON BOTH SIDES OF DOOR
A115-2		8'-0"	8'-0"		6	PER MANUFACTURE									
A115-3		10'-0"	8'-0"		7	PER MANUFACTURE									

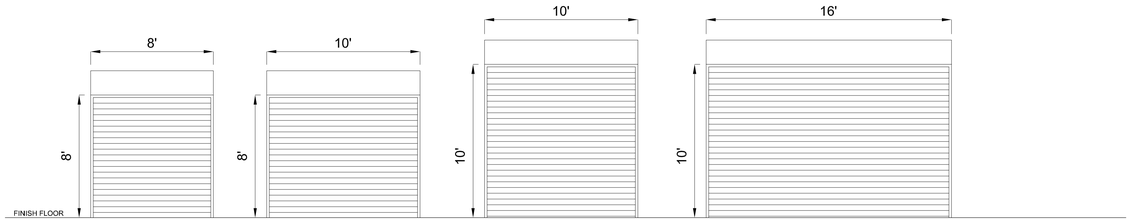


WINDOW ELEVATIONS
SCALE 1/4" = 1'-0"



DOOR ELEVATIONS
SCALE 1/4" = 1'-0"

DOOR FRAME ELEVATIONS
SCALE 1/4" = 1'-0"



OVERHEAD DOOR ELEVATIONS
SCALE 1/4" = 1'-0"
CHAIN OPERATED

ACCESSORY LEGEND

No.	NAME
A	SS CHANNEL FRAME MIRROR MOD # B-165-2436
B	PAPER TOWEL DISPENSER (MANUAL) #K34346 PAPER TOWELS #K25702
C	42" LONG GRAB BAR MOD # B-6806 SERIES
D	36" LONG GRAB BAR MOD # B-6806 SERIES
E	LIQUID SOAP DISPENSER (LUMECEL AUTOFOAM) #1980828 SOAP #AFSM
F	DOUBLE TOILET TISSUE DISPENSER #K39731 TOILET PAPER #K7006
G	NOT USED
H	RECESSED SANITARY NAPKIN DISPOSAL MOD # B-3S303
I	PARTITION MOUNTED SANITARY NAPKIN DISPOSAL MOD # B-354 SERVES TWO STALLS
J	COAT HOOK WITH BUMPER ONE AT EACH STALL DOOR BY TOILET PARTITION MFG
K	PROVIDE DOOR PULL ON BOTH SIDES OF ACCESSIBLE AND AMBULATORY STALL DOOR

GENERAL NOTES:

ALL TOILET ROOMS: PROVIDE CERAMIC TILE WAINSCOT BEHIND ALL MIRRORS.

ALL ACCESSORIES & FIXTURES SHALL BE MOUNTED FOR ADULT HEIGHT

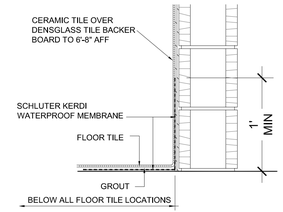
ALL RESTROOM FIXTURES TO BE TOUCHLESS (REFER TO M,E,P.)

PROVIDE SCHLUTER KERDI MEMBRANE WATERPROOFING AT ALL TOILETS ROOMS AS SPECIFIED.

PAPER TOWEL DISPENSER AND TOILET PAPER DISPENSER BY KIMBERLY CLARK

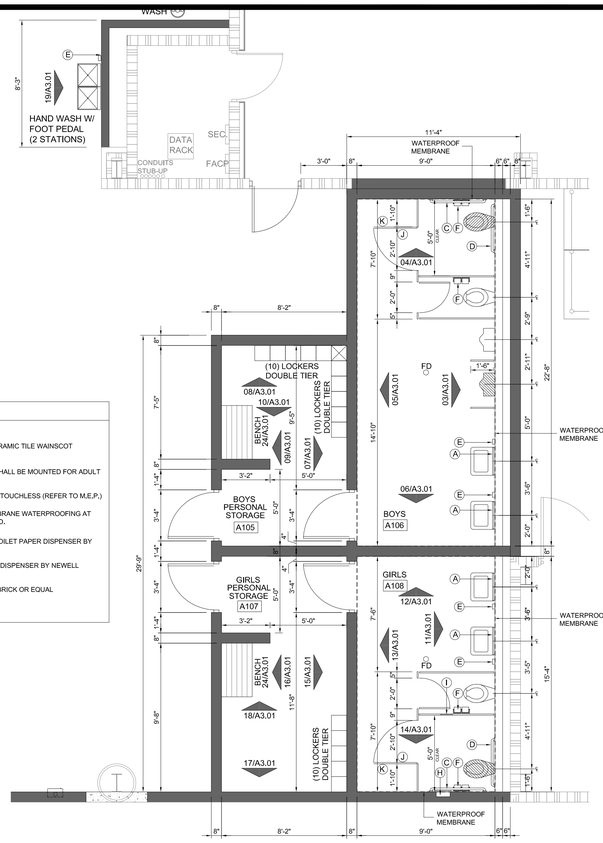
SOAP DISPENSER AND SANITIZER DISPENSER BY NEWELL RUBBERMAID

ALL OTHER ACCESSORIES BY BOBRICK OR EQUAL

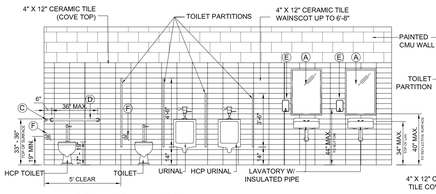


02 TOILET BASE WALL DETAIL
SCALE : 1-1/2"=1'-0"

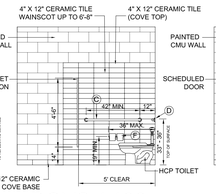
PROVIDE SCHULTER KERDI WALL PAN ALL AREAS WHERE CERAMIC TILE ARE SCHEDULED.TO RECEIVE



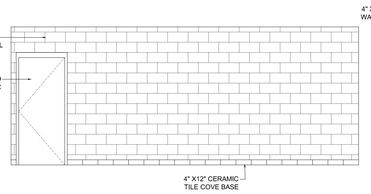
01 ENLARGED RESTROOM PLAN
SCALE : 1/4"=1'-0"
REFER TO A2.04 FOR COLOR SELECTIONS



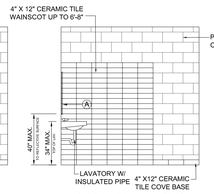
03 BOYS A106
SCALE : 1/4"=1'-0"



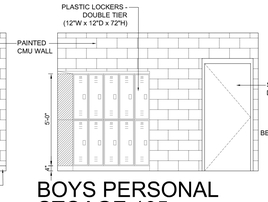
04 BOYS A106
SCALE : 1/4"=1'-0"



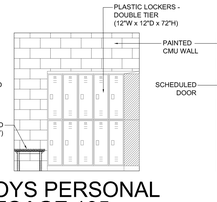
05 BOYS A106
SCALE : 1/4"=1'-0"



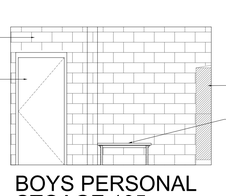
06 BOYS A106
SCALE : 1/4"=1'-0"



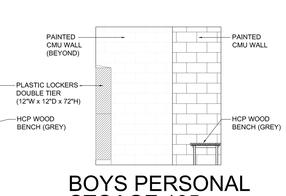
07 BOYS PERSONAL STOAGE 105
SCALE : 1/4"=1'-0"



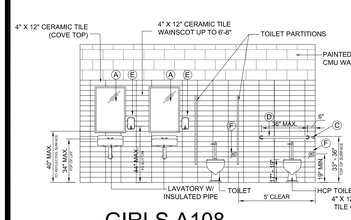
08 BOYS PERSONAL STOAGE 105
SCALE : 1/4"=1'-0"



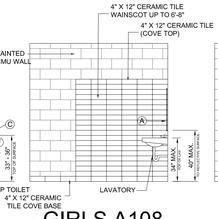
09 BOYS PERSONAL STOAGE 105
SCALE : 1/4"=1'-0"



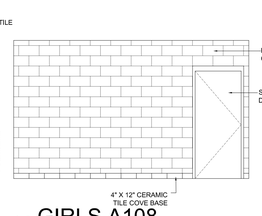
10 BOYS PERSONAL STOAGE 105
SCALE : 1/4"=1'-0"



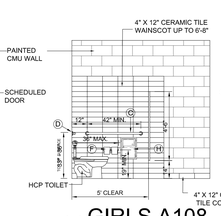
11 GIRLS A108
SCALE : 1/4"=1'-0"



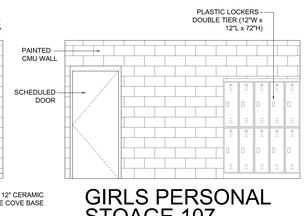
12 GIRLS A108
SCALE : 1/4"=1'-0"



13 GIRLS A108
SCALE : 1/4"=1'-0"



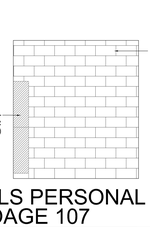
14 GIRLS A108
SCALE : 1/4"=1'-0"



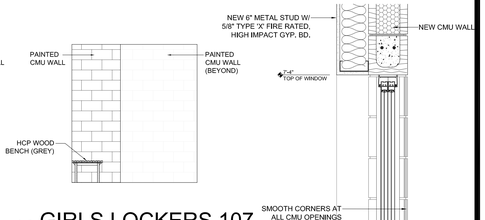
15 GIRLS PERSONAL STOAGE 107
SCALE : 1/4"=1'-0"



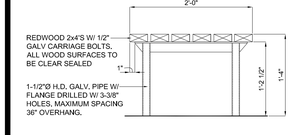
16 GIRLS PERSONAL STOAGE 107
SCALE : 1/4"=1'-0"



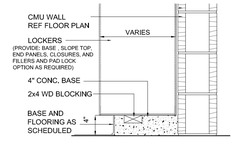
17 GIRLS PERSONAL STOAGE 107
SCALE : 1/4"=1'-0"



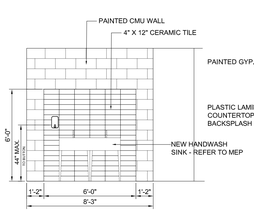
18 GIRLS LOCKERS 107
SCALE : 1/4"=1'-0"



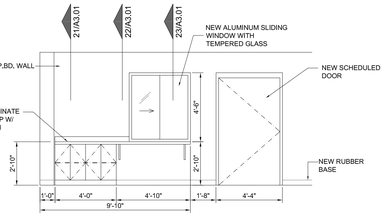
24 WOOD BENCH DETAIL
SCALE : 1/8"=1'-0"



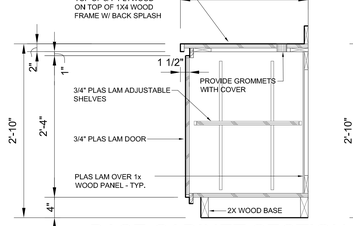
25 BASE SECTION DETAIL
SCALE : 1/8"=1'-0"
LOCKERS



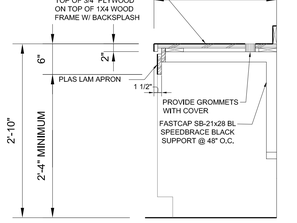
19 HANDWASH STATION
SCALE : 1/4"=1'-0"



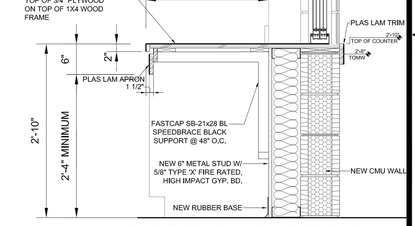
20 EXISTING STORAGE 101
SCALE : 1/4"=1'-0"



21 BASE CABINET SECTION
SCALE : 1"=1'-0"



22 COUNTER SECTION
SCALE : 1"=1'-0"



23 BASE CABINET SECTION
SCALE : 1"=1'-0"

GMS ARCHITECTS
1150 Paredes Line Rd.
Brownsville TX 78526
(956) 546-0110
fax (956) 546-0196

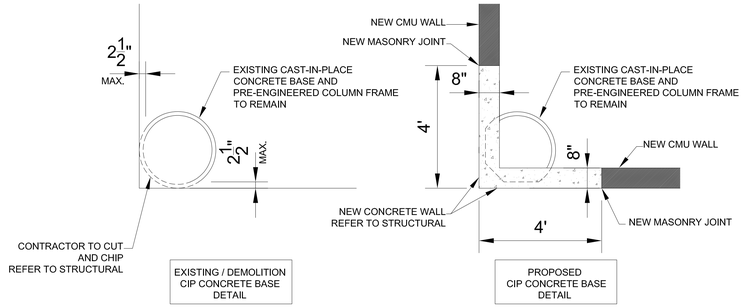
No.	REVISIONS	BY

ENLARGED RESTROOM PLAN AND INTERIOR ELEVATIONS

SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES , TEXAS

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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

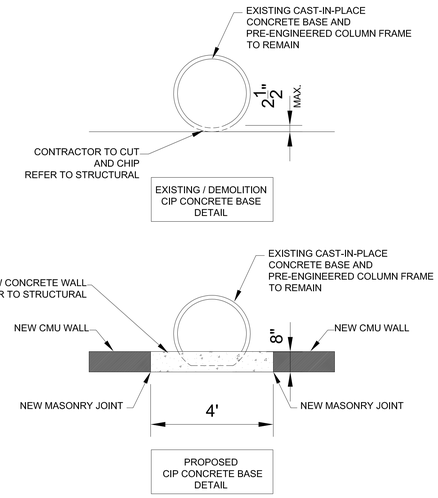
Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: IO / CM
Job No. STISD CTE AUTOMOTIVE EXPANSION 2025
Sheet: A3.01



06 TYP. CAST-IN-PLACE CONCRETE BASE

SCALE 1/2" = 1'-0"

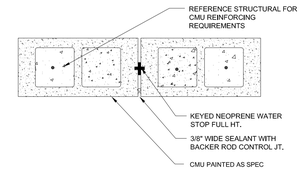
REFER TO STRUCTURAL



07 TYP. CAST-IN-PLACE CONCRETE BASE

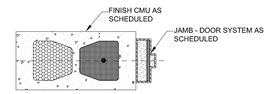
SCALE 1/2" = 1'-0"

REFER TO STRUCTURAL



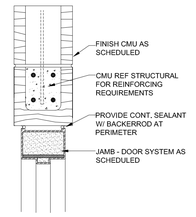
01 TYP. CMU CONTROL JT.

SCALE 1-1/2" = 1'-0"



02 DOOR JAMB

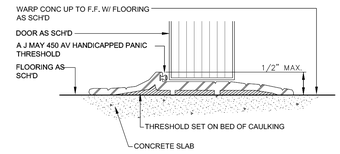
SCALE 1-1/2" = 1'-0"



03 DOOR HEAD

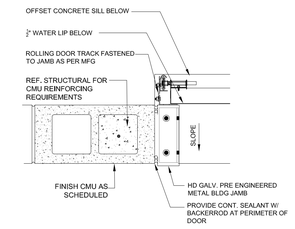
SCALE 1-1/2" = 1'-0"

PROVIDE BULLNOSE CORNER CMU TYPICAL AT ALL INTERIOR CORNERS



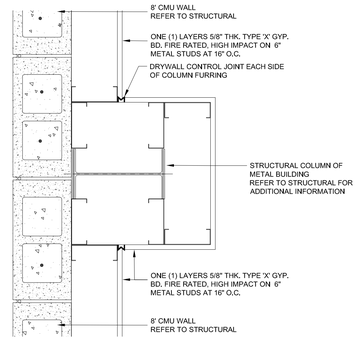
04 THRESHOLD DETAIL

SCALE 1-1/2" = 1'-0"



05 OVERHEAD DOOR JAMB

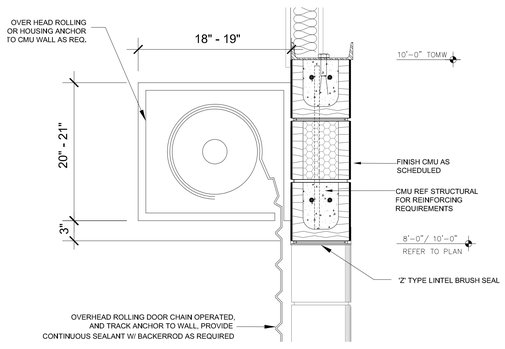
SCALE 1-1/2" = 1'-0"



10 PLAN DETAIL

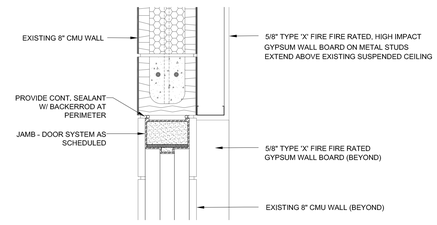
SCALE 1-1/2" = 1'-0"

EXIST. STORAGE



09 OVERHEAD DOOR HEADER

SCALE 1-1/2" = 1'-0"



08 DOOR HEAD

SCALE 1-1/2" = 1'-0"

No.	REVISIONS	BY

GMS ARCHITECTS

1150 Paredes Line Rd.
Brownsville TX 78526
(956) 546-0110
fax (956) 546-0196

PLAN DETAILS

SOUTH TEXAS I.S.D. - MERCEDES

SCI CTE AUTOMOTIVE EXPANSION 2025

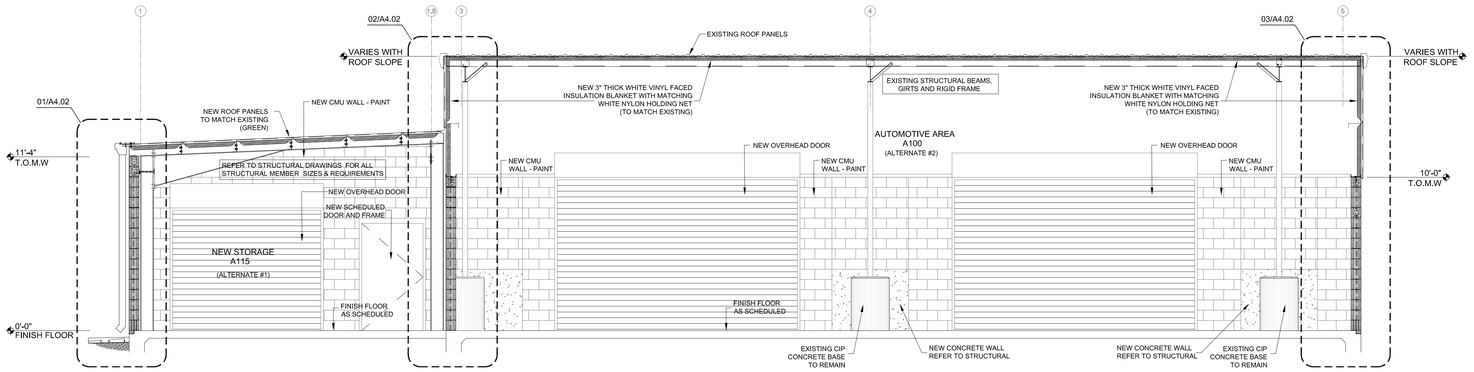
MERCEDES , TEXAS



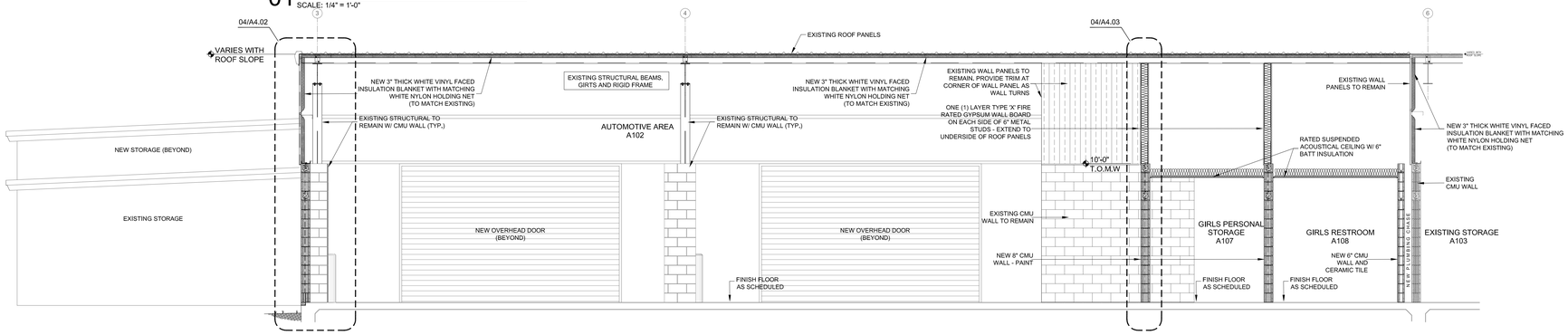
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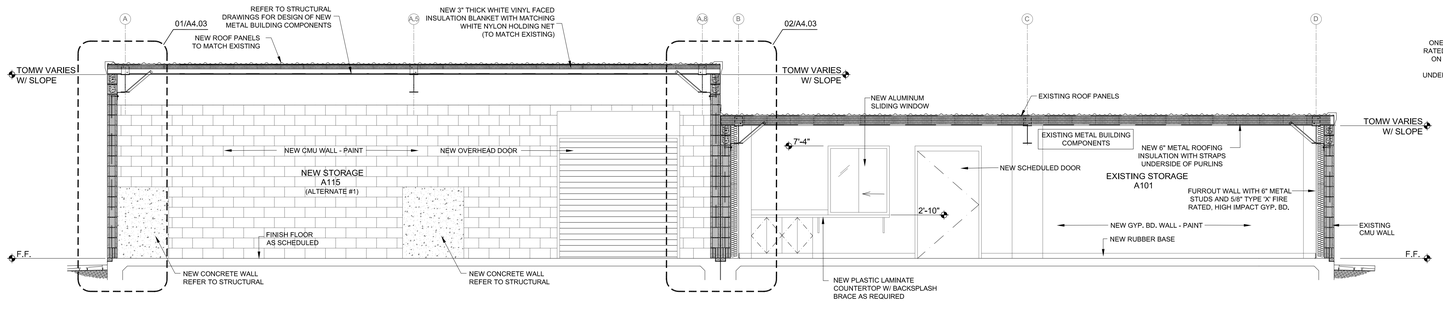
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Project Architect: David Monreal, AIA
Drawn By: IO / CM
Job No. STISD CTE AUTOMOTIVE EXPANSION 2025
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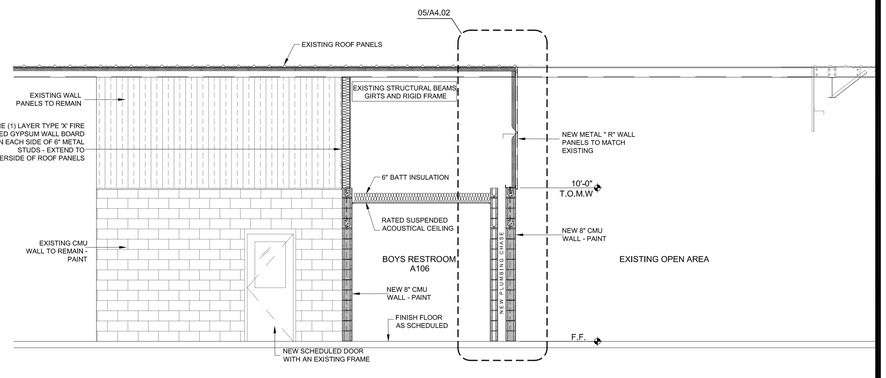
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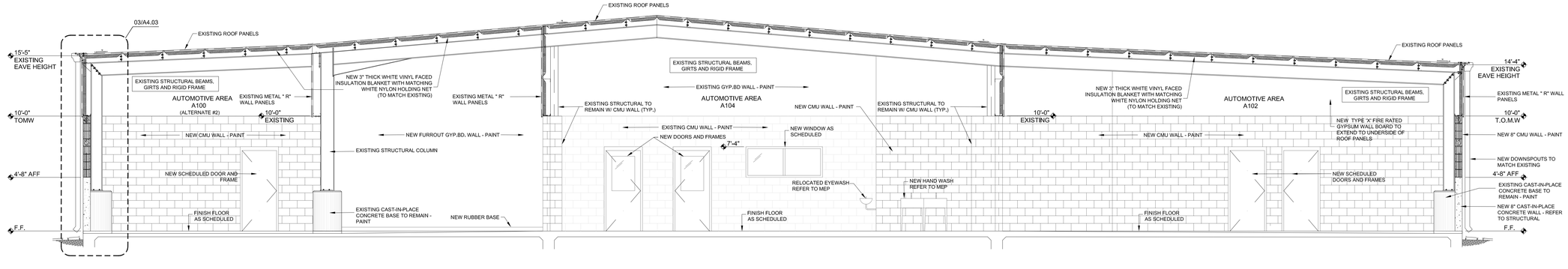
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04 BUILDING SECTION
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03 BUILDING SECTION
SCALE: 1/4" = 1'-0"



05 BUILDING SECTION
SCALE: 1/4" = 1'-0"

No.	REVISIONS	BY

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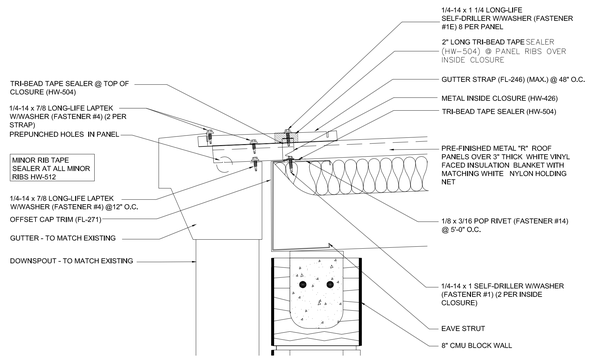
BUILDING SECTIONS

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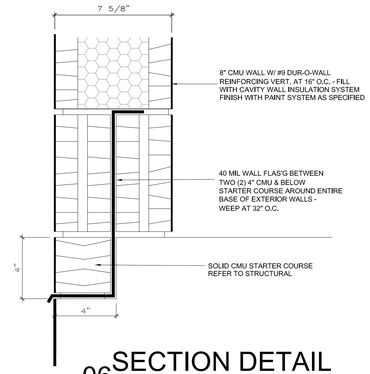
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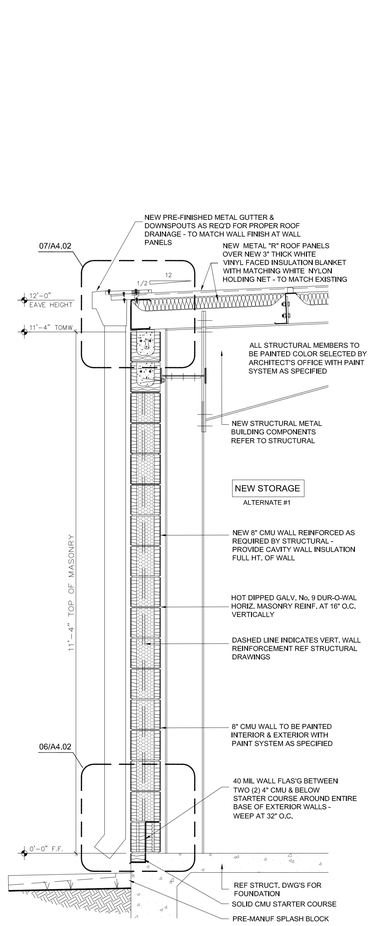
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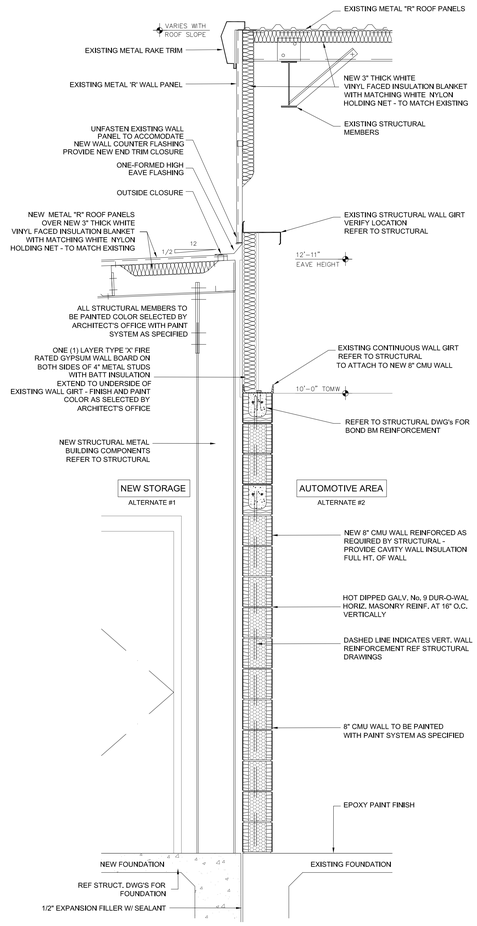
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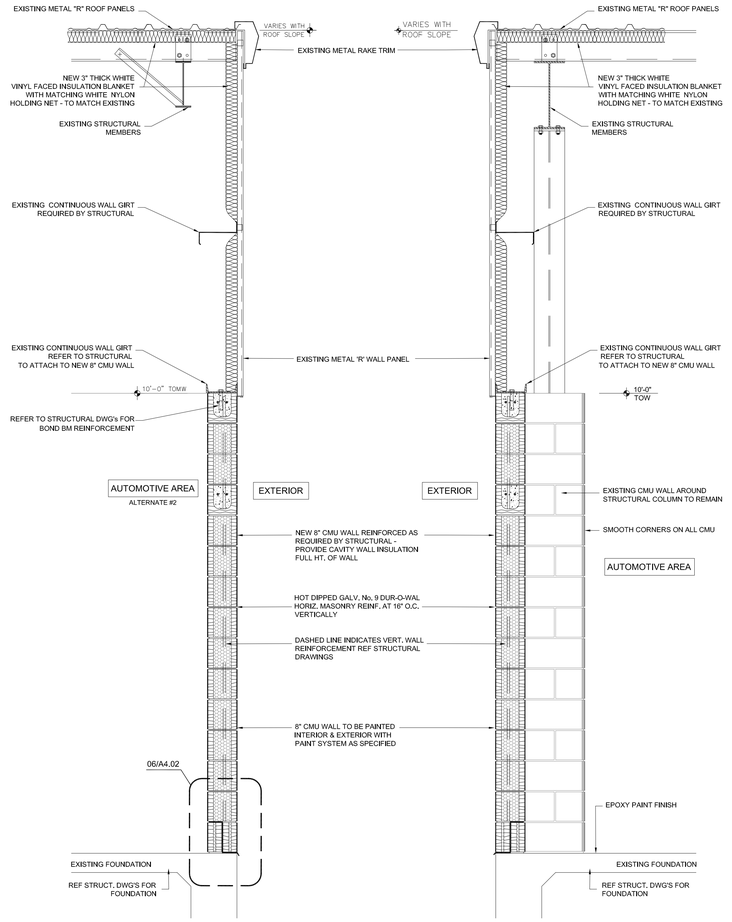
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01 WALL SECTION
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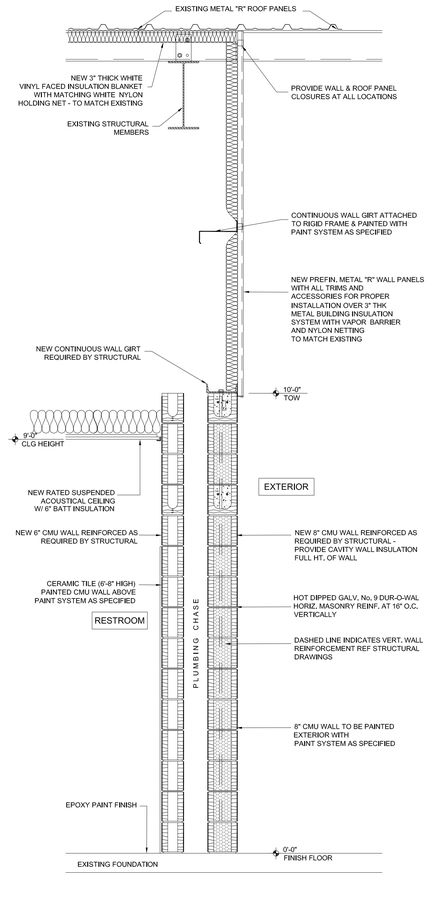


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SCALE: 3/4" = 1'-0"



05 WALL SECTION
SCALE: 3/4" = 1'-0"

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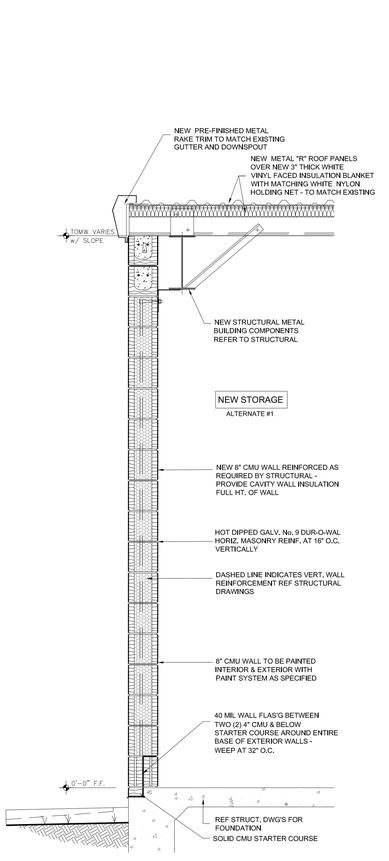
WALL SECTIONS

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MERCEDES , TEXAS

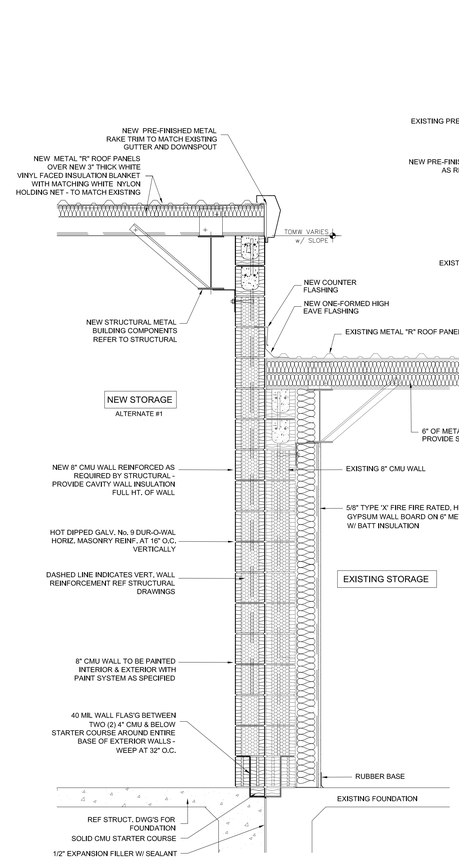
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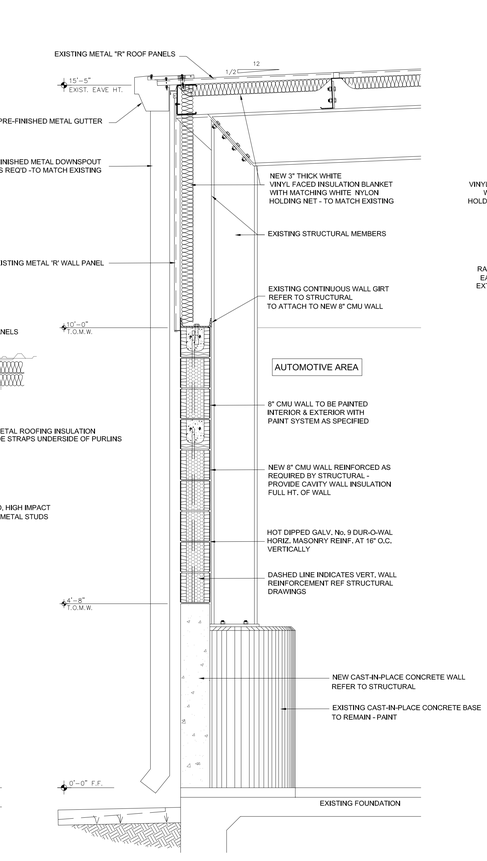
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Job No.: STISD CTE AUTOMOTIVE EXPANSION 2025
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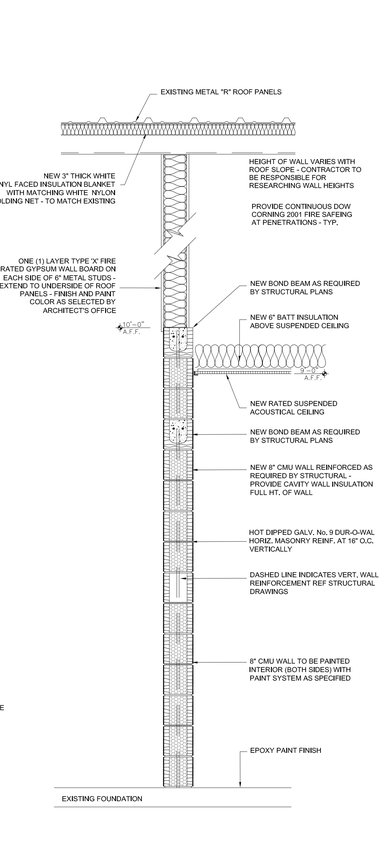
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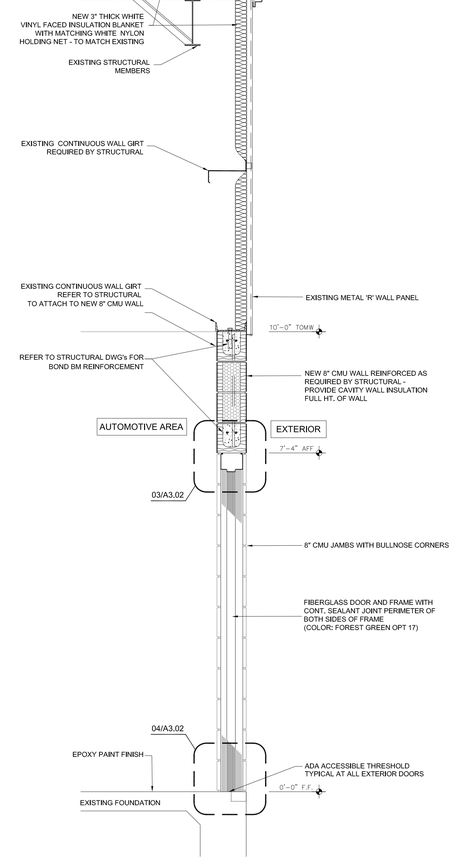
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SCALE: 3/4" = 1'-0"



04 WALL SECTION
SCALE: 3/4" = 1'-0"



05 WALL SECTION
SCALE: 3/4" = 1'-0"

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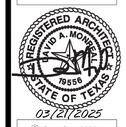
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WALL SECTIONS

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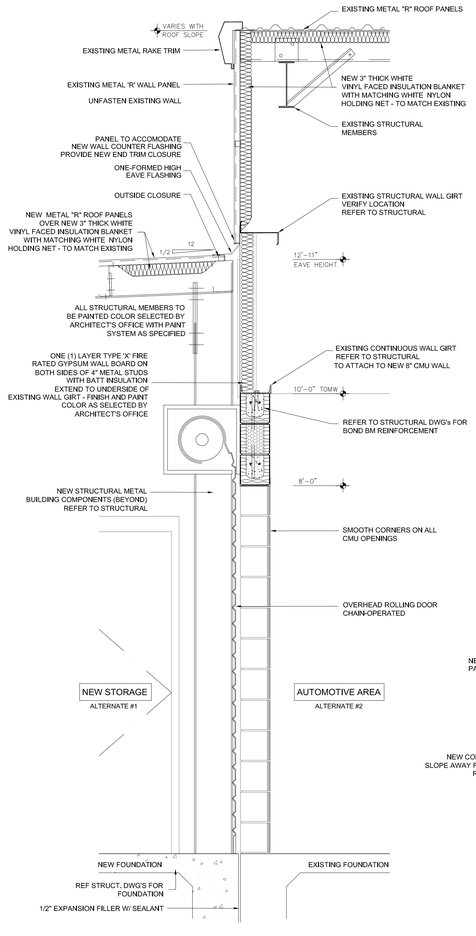
MERCEDES , TEXAS



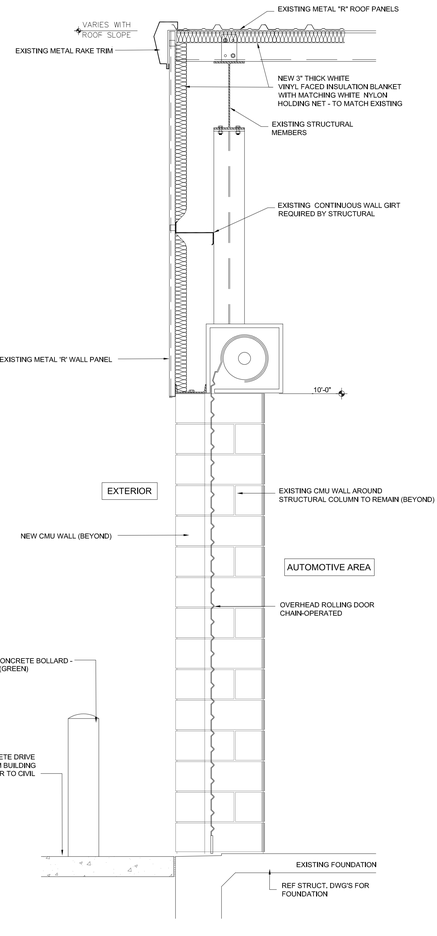
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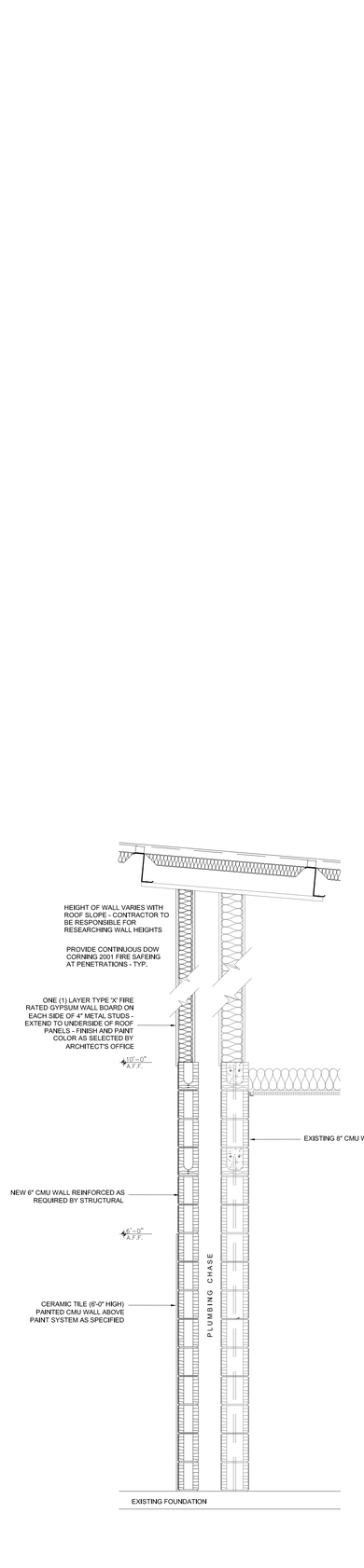
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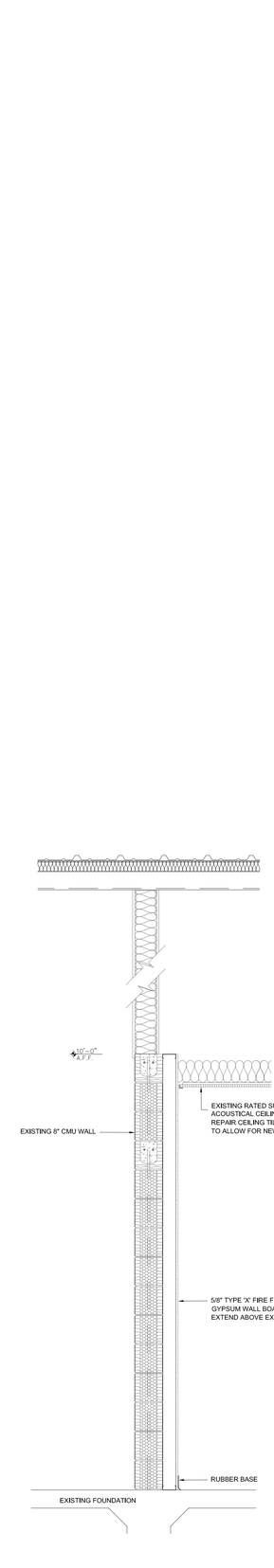
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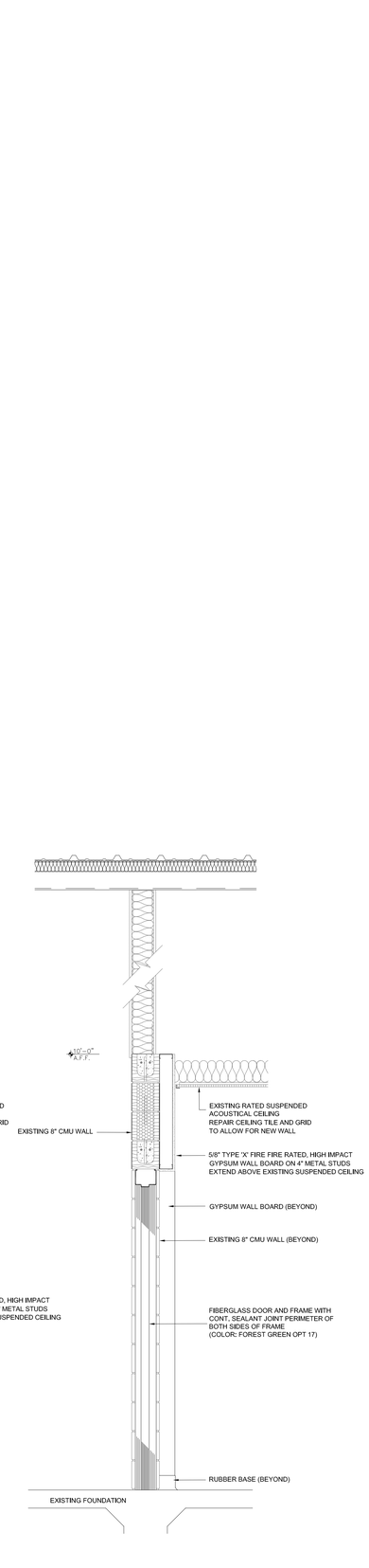
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03 WALL SECTION
SCALE: 3/4" = 1'-0"



04 WALL SECTION
SCALE: 3/4" = 1'-0"



05 WALL SECTION
SCALE: 3/4" = 1'-0"

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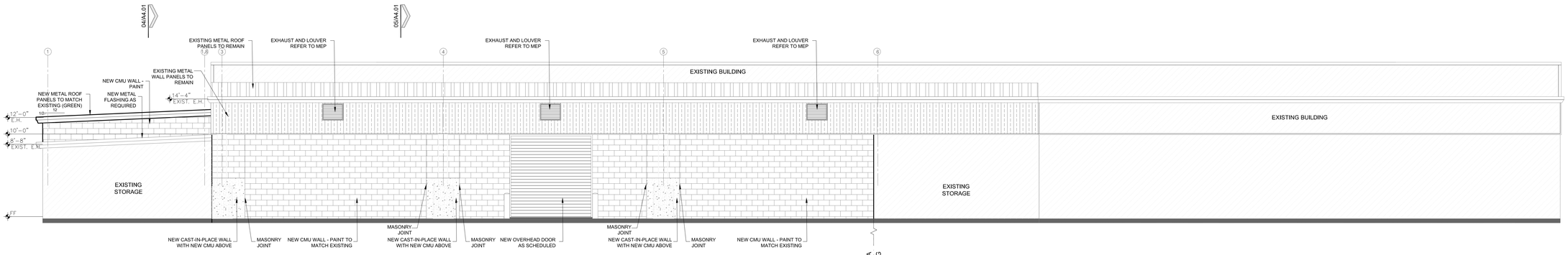
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MERCEDES , TEXAS

WALL SECTIONS

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79556
STATE OF TEXAS
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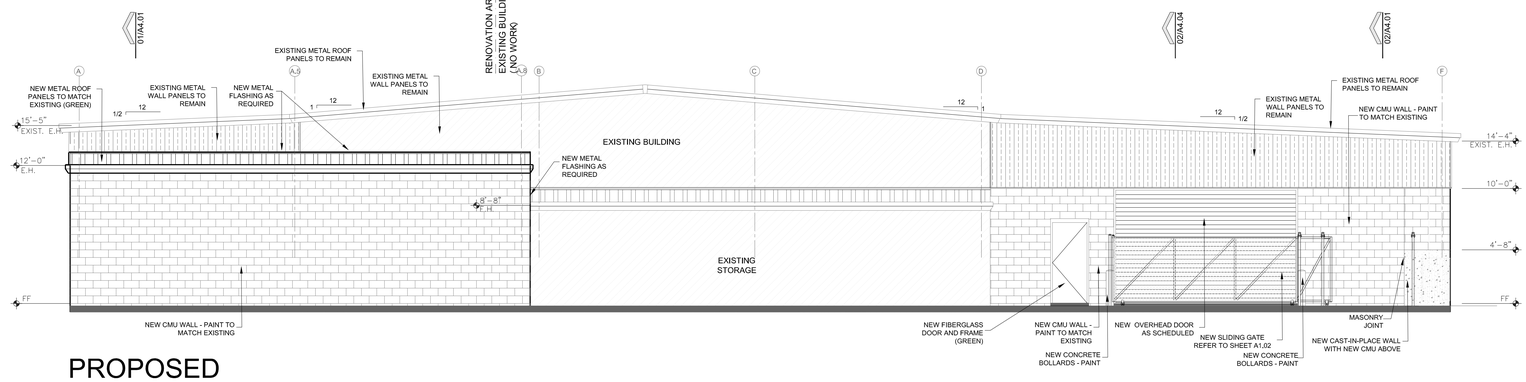
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Job No.	9160 CTE AUTOMOTIVE EXPANSION 2025
Sheet:	A4.04



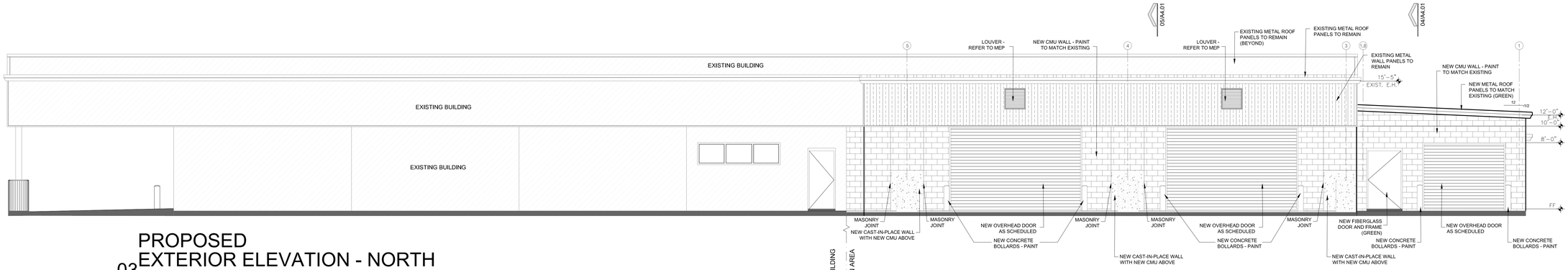
01 PROPOSED EXTERIOR ELEVATION - SOUTH

SCALE: 3/16" = 1'-0"



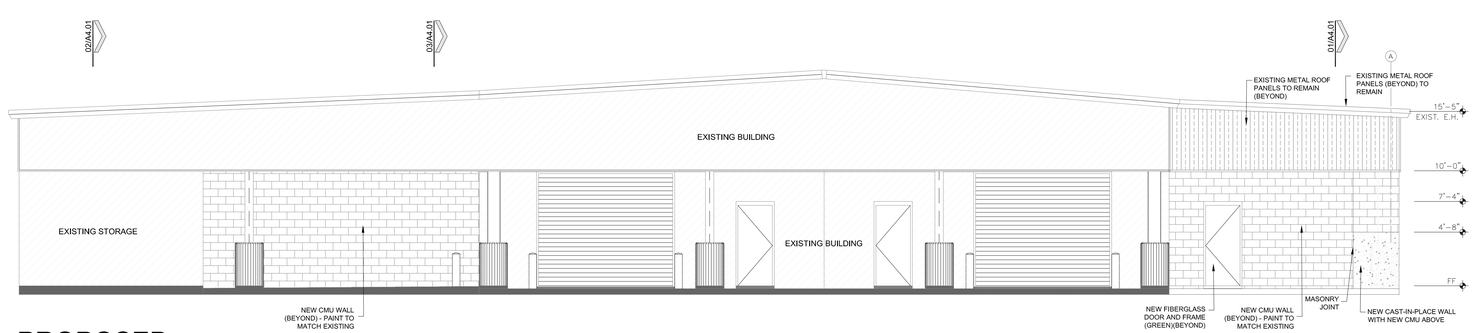
02 PROPOSED EXTERIOR ELEVATION - WEST

SCALE: 3/16" = 1'-0"



03 PROPOSED EXTERIOR ELEVATION - NORTH

SCALE: 3/16" = 1'-0"



04 PROPOSED EXTERIOR ELEVATION - EAST

SCALE: 3/16" = 1'-0"

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PROPOSED EXTERIOR ELEVATIONS

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A5.01

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 2018 EDITION OF THE **INTERNATIONAL BUILDING CODE (IBC)**.

DESIGN CRITERIA

1. BASIS FOR DESIGN AND CODE COMPLIANCE

   A. GOVERNING BUILDING CODE.......................................IBC 2018 EDITION

2. GRAVITY DESIGN
   ROOF:
   DEAD LOAD.......................................SELF-WEIGHT OF STRUCTURE & ROOFING SYSTEM
   LIVE LOAD.......................................20 PSF (REDUCIBLE)
   ADDITIONAL POINT LOADS.......................................AS NOTED ON DRAWINGS
   COLLATERAL (PRE-ENGINEERED BUILDING)..........10 PSF

3. WIND DESIGN BASED ON:

   A. ASCE 7-16 REQUIREMENTS

   DESIGN WIND SPEED .... 135 MPH (VASD=105 MPH)
   RISK CATEGORY II
   WIND EXPOSURE CATEGORY C
   INTERNAL PRESSURE COEFFICIENT (GCpi) .... +/-0.18
   Kzt 1.0
   Kd 0.85

4. DRIFT LIMIT....................................... H/300

5. THESE BUILDINGS ARE DESIGNED TO MEET ASCE 7-16 WIND PRESSURES. ALL COMPONENTS AND CLADDINGS (E.G. WINDOWS, DOORS, ARCHITECTURAL SIDINGS AND ROOF PANELS); MUST MEET MINIMUM WIND CODE REQUIREMENTS.

6. THE GENERAL CONTRACTOR MUST SUBMIT COMPONENT AND CLADDING WIND PRESSURE & RATINGS AND REQUIRED ATTACHMENT PROCEDURES TO THE ARCHITECT FOR REVIEW. SUBMITTAL INFORMATION SHALL INCLUDE A THIRD PARTY TESTING REPORT OF THE SUBMITTED ASSEMBLY; REFERENCE EXTERIOR COMPONENTS & CLADDINGS NOTES FOR ADDITIONAL REQUIREMENTS. THE GENERAL CONTRACTOR SHALL CONTACT THE ARCHITECT TO COORDINATE AND SCHEDULE REQUIRED PERIODIC INSPECTION OF EXTERIOR COMPONENTS AND CLADDINGS.

7. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING CONSTRUCTION SERVICES AS NEEDED TO SATISFY THE REQUIREMENTS OF THE DRAWINGS, THE SPECIFICATIONS, & THE REFERENCED BUILDING CODE. ALL CONSTRUCTION ADMINISTRATION COSTS ASSOCIATED WITH FIELD INSPECTIONS, SUBMITTAL PREPARATION, SUBMITTAL REVIEW, INSPECTION COORDINATION, INCLUDING ALL GENERAL CONDITIONS, OVERHEAD AND PROFIT, SHALL BE INCLUDED IN THE GENERAL CONTRACTOR'S BID.

FOUNDATION DESIGN CRITERIA

1. FOUNDATION DESIGN IS IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE, AND IS BASED ON ASSUMED GEOTECHNICAL PROPERTIES.

   A. ALLOWABLE BEARING PRESSURE:

   GRADE BEAMS & SLAB (TOTAL LOAD).......................................3.0 KSF
   FOOTINGS (TOTAL LOAD).......................................2.0 KSF

   B. POTENTIAL VERTICAL RISE (PVR).......................................2.75 INCH

2. GROUNDWATER WAS ENCOUNTERED 11'-0" BELOW NATURAL GROUND LEVEL DURING DRILLING OPERATIONS (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.

FOUNDATION NOTES

1. REMOVE **AT LEAST 36 INCHES** OF THE EXISTING SITE SOIL, VEGETATION, TREE ROOTS, DEBRIS, ETC., FROM THE PROPOSED BUILDING AREA TO A DISTANCE OF 5'-0" OUTSIDE THE BUILDING AREA (EXTERIOR OF THE FOUNDATION, INCLUDING ATTACHED IMPROVEMENTS SUCH AS SIDE WALKS AND CANOPIES). DEPTH OF REMOVAL SHALL BE VERIFIED BY A GEOTECHNICAL ENGINEER AT THE TIME OF CONSTRUCTION.

2. AFTER TOP SOIL HAS BEEN REMOVED, THE SUBGRADE SHALL BE PROOF-ROLLED IN ACCORDANCE WITH TxDOT 2014 SPECIFICATION ITEM 216. SOFT SOIL AND YIELDING AREAS, AND AREAS WHERE TREE ROOTS OR ORGANIC MATTER ARE PRESENT, SHALL BE OVER EXCAVATED AND REPLACED WITH COMPACTED SELECT FILL IN ACCORDANCE WITH THE REQUIREMENTS BELOW.

3. PROOFROLLING OPERATIONS AND EXCAVATION/BACKFILL ACTIVITIES SHOULD BE PERFORMED DURING A PERIOD OF DRY WEATHER AND OBSERVED BY A GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE TO DOCUMENT SUBGRADE CONDITIONS AND PREPARATION. IF SUBGRADE SOILS ARE ALLOWED TO BECOME WET OR SATURATED, REMOVAL AND REPLACEMENT OF SOFT SOILS SHALL BE PERFORMED AT THE CONTRACTOR'S EXPENSE. A GEOTECHNICAL ENGINEER SHALL BE CONTACTED FOR ADDITIONAL RECOMMENDATIONS, IF REQUIRED.

4. SCARIFY, MOISTURE CONDITION, AND COMPACT THE TOP 12" OF THE EXPOSED SUBGRADE TO 98% OF MAXIMUM DENSITY FROM -2% TO +2% ABOVE OPTIMUM MOISTURE CONTENT, IN ACCORDANCE WITH TEST METHOD ASTM D-698 STANDARD PROCTOR. MOISTURE CONTENT SHALL BE AS NOTED IMMEDIATELY PRIOR TO PLACING SELECT FILL.

5. RESTORE GRADE USING SELECT FILL AS REQUIRED TO PROVIDE THE SPECIFIED **FINISH FLOOR ELEVATION**, AND PROPER SITE DRAINAGE, COMPACTED IN ACCORDANCE WITH THE REQUIREMENTS BELOW. FINISH FLOOR SHALL BE VERIFIED WITH ARCHITECT AND CIVIL ENGINEER.

6. SELECT FILL SHALL BE COMPACTED IN THE FIELD IN LIFTS NOT TO EXCEED 8" LOOSE MEASURE (6" COMPACTED LIFT) TO A MINIMUM OF 95% OF MAXIMUM DENSITY FROM -2% TO +2% ABOVE OPTIMUM MOISTURE CONTENT AS EVALUATED BY ASTM D-698 STANDARD PROCTOR.

7. SELECT FILL MATERIALS SHALL BE CLAYEY GRAVEL (GC), CLAYEY SAND (SC) OR LEAN CLAY (CL) WHEN CLASSIFIED IN ACCORDANCE WITH USCS ASTM D2487. SELECT FILL SHALL BE FREE OF DEBRIS AND ORGANIC MATERIAL, SHALL HAVE A PLASTICITY INDEX (PI) BETWEEN 10-17, MAXIMUM LIQUID LIMIT (LL) OF 40 AND NO PARTICLES LARGER THAN 4" IN DIAMETER.

8. FOUNDATION CONCRETE SHALL NOT BE PLACED ON SELECT FILL SOILS THAT HAVE BEEN DISTURBED BY RAINFALL OR WATER SEEPAGE. IF BEARING SOILS ARE SOFTENED BY WATER INTRUSION, OR BY DESICCATION, THE UNSUITABLE SOILS SHALL BE REMOVED FROM THE FOUNDATION EXCAVATION AND BE REPLACED WITH PROPERLY COMPACTED SELECT FILL PRIOR TO PLACEMENT OF FOUNDATION CONCRETE. ALL SOIL REMOVAL AND REPLACEMENT COSTS, INCLUDING ASSOCIATED COSTS TO REMOVE AND REINSTALL REINFORCEMENT AND VAPOR RETARDER MATERIALS, SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR. DEPTH OF SOIL REMOVAL AND RECOMPACTION REQUIREMENTS SHALL BE COORDINATED WITH A GEOTECHNICAL ENGINEER.

9. SAMPLES OF PROPOSED SELECT FILL SHALL BE FURNISHED TO THE TESTING LABORATORY 10 DAYS PRIOR TO INSTALLATION TO PERMIT TIME FOR SPECIFICATION COMPLIANCE INSPECTION AND REVIEW BY A GEOTECHNICAL ENGINEER.

10. LABORATORY MOISTURE-DENSITY CURVES SHALL BE DEVELOPED FOR SUBGRADE AND FILL. PROCTOR CURVES AND FIELD DENSITY TESTS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW. A MINIMUM OF ONE (1) IN PLACE DENSITY TEST PER 2,500 SQUARE FEET OF SLAB AREA SHALL BE TAKEN ON EACH LIFT DURING PLACEMENT OF SELECT FILL. DENSITY REPORTS SHALL BE TRANSMITTED TO ENGINEER WITHIN 3 DAYS AFTER TESTS ARE MADE.

11. GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS TESTS SHALL BE PERFORMED DURING FILL PLACEMENT AT A RATE OF ONE TEST PER 5,000 CUBIC YARDS OF FILL BROUGHT TO THE SITE. SAMPLES FOR TEST SHALL BE TAKEN FROM JOBSITE MATERIALS.

12. THE CONTRACTOR SHALL PROVIDE A CLAY CAP AROUND THE PERIMETER OF BUILDING FOUNDATION TO REDUCE THE POSSIBILITY OF SURFACE RUNOFF INFILTRATION BELOW THE FOUNDATION. CONTRACTOR SHALL EXCAVATE BUILDING PAD TO A DEPTH OF AT LEAST 18 INCHES BELOW FINAL GRADES, REMOVE THE SELECT FILL SOILS AND REPLACE THEM WITH MOISTURE CONDITIONED AND COMPACTED LEAN CLAY (CL) SOILS AS CLASSIFIED ACCORDING TO THE UNIFIED SOIL CLASSIFICATION SYSTEM (USCS). CLAY CAP SHOULD BE SLOPED AWAY FROM THE FOUNDATION AT A MINIMUM SLOPE OF 2%. CLAY SOILS SHALL BE FREE OF ROOTS OR OTHER ORGANIC OR DEGRADABLE MATERIALS, MEET THE GRADATION AND ATTERBERG LIMITS REQUIREMENTS AND BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8 INCHES, AND COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-698 STANDARD PROCTOR. THE MOISTURE CONTENT SHALL BE MAINTAINED WITHIN THE RANGE OF OPTIMUM TO +4% ABOVE OPTIMUM.

13. SITE SHALL BE GRADED SO THAT WATER DOES NOT POND WITHIN 10 FEET OF THE PERIMETER FOUNDATION BEAM DURING OR AFTER CONSTRUCTION. THE SLOPE OF THE GROUND SURFACE AWAY FROM THE STRUCTURE SHOULD BE A MINIMUM OF FIVE (5%) PERCENT FOR A DISTANCE OF AT LEAST TEN (10') FEET. ELEVATION OF GROUND SURFACE ADJACENT TO THE FOUNDATION SHOULD BE AT LEAST 6 INCHES BELOW FINISH FLOOR.

FOUNDATION NOTES CONTINUED:

14. FINAL DRAINAGE IS VERY IMPORTANT TO THE PERFORMANCE OF THE FOUNDATION. LANDSCAPING, PLUMBING, AND DOWNSPOUT DRAINAGE ARE ALSO VERY IMPORTANT. IT IS VITAL THAT ALL ROOF DRAINAGE BE TRANSPORTED AWAY FROM BUILDINGS SO THAT NO AREAS OF WATER POND AROUND BUILDINGS, WHICH CAN RESULT IN SOIL VOLUME CHANGE UNDER THE FOUNDATION. PLUMBING LEAKS SHOULD BE REPAIRED AS SOON AS POSSIBLE IN ORDER TO MINIMIZE THE MAGNITUDE OF MOISTURE CHANGE UNDER THE SLAB. LARGE TREES AND SHRUBS SHOULD NOT BE PLANTED IN THE IMMEDIATE VICINITY OF THE STRUCTURE, SINCE THE ROOT SYSTEMS CAN CAUSE A SUBSTANTIAL REDUCTION IN SOIL VOLUME IN THE VICINITY OF THE TREE DURING DRY PERIODS. BUSHES AND TREES SHOULD BE PLANTED A REASONABLE DISTANCE AWAY FROM THE STRUCTURE SO THAT THEIR CANOPY OR "DRIP LINE" DOES NOT EXTEND BEYOND THE PERIMETER OF THE FOUNDATION. WATERING OF VEGETATION SHOULD BE PERFORMED IN A TIMELY AND CONTROLLED MANNER. PROLONGED WATERING SHOULD BE AVOIDED.

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. WELDED WIRE FABRIC MATS SHALL BE ASTM A185.

9. ALL ACCESSORIES SHALL BE IN ACCORDANCE WITH ACI 315, LATEST EDITION.

10. SLAB MAT TO BE SUPPORTED BY PLASTIC CHAIRS SPACED AT 4 FEET ON CENTER EACH WAY (MAX). BEAM CAGES SUPPORTED BY BATTS AT 4 FEET ON CENTER.

11. VERTICAL CONSTRUCTION JOINTS IN FLOOR SHALL BE COORDINATED WITH STRUCTURAL ENGINEER PRIOR TO FORMING SLAB. CRACK CONTROL JOINTS SHALL BE PROVIDED AT LOCATIONS SHOWN ON THE PLANS. CONTROL JOINTS SHALL BE SAWCUT (IMMEDIATELY SUBSEQUENT TO FINISHING SLAB) WITH "SOFF-CUT" SYSTEM. JOINTS SHALL BE CLEANED AND FILLED WITH "SONOLASTIC SL1" WITHIN TWO (2) DAYS AFTER SAWCUTTING. NO HORIZONTAL JOINTS WILL BE PERMITTED IN SLABS OR BEAMS UNLESS APPROVED BY THE ENGINEER.

12. PROVIDE 2 TOP & BOTTOM CORNER BARS AT ALL DISCONTINUOUS GRADE BEAMS AND FOUNDATION CORNERS. CORNER BARS SHALL BE 4'-0" IN LENGTH (2'-0" LEGS). SIZE OF THE CORNER BARS SHALL MATCH THE SIZE OF THE GRADE BEAM REINFORCING AS SHOWN BY STRUCTURAL DRAWINGS.

13. MAINTAIN A MINIMUM OF ONE AND ONE-HALF (1-1/2) TIMES THE MAXIMUM COARSE AGGREGATE SIZE BETWEEN ALL REINFORCING BARS (EXCEPT AT LAPS).

14. BARS SCHEDULED OR DETAILED "CONT" SHALL BE LAPPED 40 BAR DIAMETERS (24 INCHES MINIMUM) UNLESS OTHERWISE NOTED.

15. 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.

16. 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.

17. CONSTRUCT FORMS SO THAT JOINTS ARE LEAKPROOF. MAINTAIN FORMS SUFFICIENTLY RIGID TO PREVENT DEFORMATION UNDER LOAD.

18. CONCRETE MAY BE PLACED WITH CHUTES UP TO 25' MAXIMUM. SLUMP SHALL NOT EXCEED 6" AT TRUCK DISCHARGE POINT.

19. 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.

20. 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'

21. CONCRETE TO BE CURED IN ACCORDANCE WITH ACI RECOMMENDATIONS. PROPOSED METHOD OF CURING TO BE COORDINATED WITH ENGINEER PRIOR TO CONCRETE PLACEMENT.

22. 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.

23. 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.

24. 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, AND STEEL JOIST INSTITUTE.

5. ALL STEEL BAR JOISTS SHALL BE DESIGNED AND FABRICATED BY A MEMBER OF THE STEEL JOIST INSTITUTE. IF REQUESTED BY THE A/E, THE CONTRACTOR SHALL PROVIDE WRITTEN CERTIFICATE OF FABRICATOR'S MEMBERSHIP TO THE STEEL JOIST INSTITUTE AT TIME OF SHOP DRAWING SUBMITTAL.

6. BAR JOISTS SHALL BE BOLTED WHERE COLUMNS ARE FRAMED WITH STRUCTURAL STEEL MEMBERS IN ONLY ONE DIRECTION TO PROVIDE LATERAL STABILITY DURING CONSTRUCTION/ERECTION AS REQUIRED BY OSHA.

7. TOTAL LOAD DEFLECTION OF SPECIAL BAR JOIST SHALL NOT EXCEED L/240.

8. JOIST MANUFACTURER SHALL PROVIDE BRIDGING AS REQUIRED TO ADEQUATELY BRACE JOISTS AGAINST LATERAL MOVEMENT AND NET UPLIFT OF 40 PSF.

9. 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.

10. REFER TO ARCHITECTURAL & MECHANICAL PLANS FOR VERIFICATION OF ALL BOLTS, BLOCKING ANCHORS, ETC., FOR THE ANCHORAGE OF THEIR RESPECTIVE ITEMS.

11. ALL BEAMS AND COLUMNS SHALL BE FULL LENGTH WITHOUT SPLICES UNLESS INDICATED ON PLANS OR APPROVED BY THE ENGINEER IN WRITING.

STRUCTURAL STEEL CONTINUED:

12. SHOP AND FIELD WELDS SHALL BE MADE BY WELDERS WHO HAVE BEEN QUALIFIED AND CERTIFIED THE REQUIRED WELDS IN ACCORDANCE WITH THE LATEST AMERICAN WELDING SOCIETY SPECIFICATION (A.W.S. D-1.1).

13. WELDS SHALL BE MADE WITH COVERED MILD STEEL ELECTRODES COMPLYING WITH AWS D1 CODE AND SERIES E 70XX.

14. ERECTION CONNECTORS SHALL BE PROVIDED IN ORDER TO PROPERLY ALIGN AND BE TRUE AND PLUMB WHEN WELDS ARE MADE.

15. ALL COMPLETE PENETRATION WELDS, BOTH SHOP AND FIELD, SHALL BE TESTED BY A QUALIFIED TESTING LABORATORY UTILIZING ULTRA SONIC TESTING PROCEDURES IN ACCORDANCE WITH AWSD1.1 ANY WELDS FOUND DEFECTIVE SHALL BE REMOVED AND REPLACED AT NO ADDITIONAL COST TO THE OWNER. ALL X-RAYED WELDS SHALL BE GROUND SMOOTH.

16. THE FABRICATOR SHALL SUPPLY BACK-UP PLATES AND EXTENSION TABS FOR ALL COMPLETE PENETRATION WELDS.

17. ALL STEEL MEMBERS, INCLUDING BAR JOISTS, UNLESS NOTED OTHERWISE, SHALL BE PAINTED W/ ONE COAT OF SHOP PRIMER. DO NOT PRIME ITEMS TO BE EMBEDDED IN CONCRETE OR FIRE PROOFED W/ SPRAY ON MATERIAL WITHOUT COORDINATION W/ THE ARCHITECT. GALVANIZED DECK SHALL BE CONFORM TO ASTM A525, G60 (MINIMUM).

18. REINFORCE STEEL DECK OPENINGS (FLOOR & ROOF) FROM 6" TO 18" WITH 2 x 2 x 1/4 STEEL ANGLE PLACE ANGLES PERPENDICULAR TO FLUTES, EXTEND MINIMUM OF TWO FLUTES BEYOND EACH SIDE OF OPENING AND WELD DECK AT EACH FLUTE. OPENINGS LARGER THAN 18" SHALL BE REINFORCED WITH 3 x 3 x 1/4 STEEL ANGLES WELDED TO TOP CHORD OF BAR JOISTS UNLESS SHOWN OTHERWISE ON PLANS. WELD DECK TO ANGLE AT 6" O/C AT PERIMETER OF OPENINGS.

19. STEEL LINTELS SUPPORTING BRICK VENEER AT EXTERIOR WALLS SHALL BE ONE HOT-DIPPED GALVANIZED 5 x 5 x 5/16 ANGLE, UNLESS NOTED OTHERWISE.

20. WELDED HEADED STUDS (WHS) SHALL BE "NELSON ANCHORS", OR EQUAL, Fs = 60 KSI, DIAMETER AND LENGTH AS SHOWN ON PLANS. STUDS TO BE WELDED & SHOP TESTED IN ACCORDANCE W/ THE MANUFACTURER'S RECOMMENDATIONS.

21. 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". ROOF DECK WELDS TO BE CLEANED AND PAINTED PRIOR TO INSTALLING ROOF INSULATION.

22. 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.

23. ELECTRONIC (PDF) 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.

24. 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.

25. THE STRUCTURAL ENGINEER SHALL BE NOTIFIED FOR A FRAMING OBSERVATIONS IMMEDIATELY AFTER ROOF DECK IS 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.

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.

PRE ENGINEERED METAL BUILDING

1. REFERENCE SCHEMATIC ROOF FRAMING PLAN AND DESIGN CRITERIA FOR DESIGN LOAD REQUIREMENTS AND SPECIFICATIONS FOR PERTINENT INFORMATION REGARDING THE PRE-ENGINEERED STRUCTURE. SPECIFICATIONS FOR THE PRE-ENGINEERED BUILDING, OTHER THAN LOAD AND CODE SPECIFICATIONS, ARE NOT IN THE SCOPE OF SERVICE PROVIDED BY THE PROJECT STRUCTURAL ENGINEER.

2. THE BUILDING MANUFACTURER SHALL FURNISH DESIGN CERTIFICATION SIGNED AND SEALED BY A STATE OF TEXAS REGISTERED PROFESSIONAL ENGINEER FOR THE STRUCTURAL FRAMING AND COVERING PANELS OF THE METAL BUILDING SYSTEM. CERTIFICATION TO SPECIFICALLY STATE THAT THE DESIGN MEETS OR EXCEEDS THE APPLICABLE REQUIREMENTS OF THE IBC.

PRE ENGINEERED METAL BUILDING CONTINUED

3. THE ABOVE REFERENCED CERTIFICATION BY THE PRE-ENGINEERED BUILDING DESIGN ENGINEER SHALL BE INCLUDED WITH THE SEALED BUILDING ERECTION AND FABRICATION DRAWINGS WHEN SUBMITTED FOR REVIEW BY THE DESIGN TEAM. A REVIEW PACKAGE WITHOUT THE SIGNED AND SEALED CERTIFICATION FORMS AND SEALED BUILDING PLANS WILL NOT BE REVIEWED FOR THE RECORD BY THE STRUCTURAL ENGINEER.

4. THIS BUILDING IS SPECIFIED TO BE AN ENCLOSED BUILDING AS DEFINED BY ASCE 7. ACCESSORIES (DOORS, WINDOWS, ETC.) MUST BE DESIGNED AS COMPONENTS AND CLADDING IN ACCORDANCE TO THE SPECIFIC WIND CODE DESIGNATED IN THE GENERAL STRUCTURAL NOTES.

5. ALL COMPONENTS SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, AND THE METAL BUILDING MANUFACTURER ASSOCIATION.

6. ALL COMPONENTS SHALL BE SIZED FOR ALL DEAD LOADS, LIVE LOADS, WIND LOADS AS OUTLINED IN DESIGN CRITERIA AND/OR SPECIFIED ON PLANS.

7. ROOF SYSTEM INCLUDING PANELS, FASTENERS, AND TRIM MATERIALS SHALL MEET OR EXCEED THE WIND UPLIFT PRESSURE REQUIREMENTS NOTED ON THE DRAWINGS. METAL PANEL ROOF SYSTEM SHALL BE TESTED PER ASTM E1592 TO MEET OR EXCEED TWICE THE HIGHEST WIND PRESSURES NOTED ON THE DRAWINGS.

8. SHOP DRAWINGS AND CALCULATIONS SHALL BE PERFORMED BY AN ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS. CALCULATIONS & SHOP DRAWINGS SHALL BE TRANSMITTED AS A SINGLE ELECTRONIC FILE (PDF FORMAT) TO THE A/E FOR REVIEW PRIOR TO FABRICATION OF COMPONENTS.

9. REFER TO ARCHITECTURAL & M.E.P. DRAWINGS FOR ROOF SUPPORTED ITEMS INCLUDING FANS, PLUMBING, LIGHTING, PIPING, DUCTWORK, ETC. AND PROVIDE SUPPORT FRAMING FOR ADDITIONAL LOADS AS REQUIRED.

10. PURLIN SPACING TO BE DETERMINED BY BUILDING SUPPLIER. TOTAL LOAD DEFLECTION SHALL NOT EXCEED OF L/180.

METAL BUILDING COMPONENTS

1. ALL COMPONENTS SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS AND STANDARDS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, AND THE LIGHT GAGE STRUCTURAL INSTITUTE.

2. PURLINS AND EAVE STRUTS SHALL BE FABRICATED FROM STEEL HAVING A MINIMUM YIELD OF 55 KSI. ALL MEMBERS SHALL BE PAINTED WITH ONE COAT OF RED OXIDE OR APPROVED SHOP COAT. PURLINS SHALL BE SHOP PUNCHED AND LAPPED AS SHOWN ON THE ROOF FRAMING PLANS. EAVE STRUTS SHALL BE INSTALLED WITH BOLTED CONNECTIONS. PURLINS AND EAVE STRUTS TO BE SECURED WITH MINIMUM 1/2 DIAMETER BOLTS (A307 GRADE).

3. SAG STRAPS SHALL BE LOCATED AS SHOWN ON THE PLANS. STRAPS SHALL BE FABRICATED FROM STEEL HAVING A MINIMUM YIELD OF 50 KSI. THE STRAPS SHALL BE SECURED TO THE TOP AND BOTTOM FLANGES OF ALL PURLINS WITH #14 TEK SCREWS.

LIGHTWEIGHT STEEL FRAMING (STEEL STUDS)

1. THE **GENERAL CONTRACTOR, PROJECT SUPERINTENDENT AND THE LIGHTWEIGHT STEEL FRAMING FOREMAN** SHALL MEET WITH THE STRUCTURAL ENGINEER PRIOR TO THE START OF LIGHTWEIGHT STEEL FRAMING WORK TO REVIEW PROJECT REQUIREMENTS AND PROCEDURES.

2. ALL STUDS AND ACCESSORIES SHALL BE OF THE TYPE, SIZE, GAUGE AND SPACING SHOWN ON THE DRAWINGS. STUD MANUFACTUREING OF ALL MEMBERS AND ACCESSORIES SHALL COMPLY w/ ASTM C 955.

3. ALL STUDS AND JOIST MEMBERS 16 GAUGE AND HEAVIER SHALL BE FORMED FROM STEEL CORRESPONDING TO A TYPE LISTED IN THE A.I.S.I. "SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS", WITH A MINIMUM YIELD STRENGTH OF 50 KSI UNLESS SPECIFICALLY NOTED OTHERWISE.

4. ALL 18 GAUGE AND LIGHTER MEMBERS, TRACK, BRIDGING, AND ACCESSORY ITEMS SHALL BE FORMED FROM STEEL "SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS", WITH A MINIMUM YIELD STRENGTH OF 33 KSI UNLESS SPECIFICALLY NOTED OTHERWISE.

5. ALL FRAMING PRODUCTS SHALL BE FORMED FROM STEEL POSSESSING A COATING CORRESPONDING TO THE MINIMUM REQUIREMENTS OF ASTM 653, G60.

6. ALL FRAMING COMPONENTS SHALL BE CUT SQUARELY FOR ATTACHMENT TO PERPENDICULAR MEMBERS, OR, AS REQUIRED, FOR AN ANGULAR FIT AGAINST ABUTTING MEMBERS.

7. ALL FIELD CUTTING OF STUDS MUST BE DONE BY SAWING OR SHEARING. TORCH CUTTING OF COLD FORMED MEMBERS IS UNACCEPTABLE.

8. WHEN REQUIRED FOR BRIDGING PURPOSES, THE FRAMING FABRICATOR IS TO ENSURE PUNCH OUT ALIGNMENT WHEN ASSEMBLING FRAMING AND FIELD CUTTING STUDS TO LENGTH. REFER TO TYPICAL STUD/TRACK CONNECTION AND INDEXING DETAILS.

9. NO SPLICES IN STUDS, JOISTS, OR OTHER LOAD CARRYING MEMBERS MAY BE MADE WITHOUT PRIOR ENGINEERING REVIEW AND SPECIFIC DETAILS FOR ANY SUCH SPLICE(S).

10. NO NOTCHING OR COPING OF STUDS, JOISTS OR RAFTERS IS ALLOWED, UNLESS STATED WITHIN THIS DRAWING PACKAGE.

11. WHERE SPLICING OF WALL TRACK IS NECESSARY BETWEEN STUDS, A PIECE OF STUD SHALL BE PLACED IN THE ADJOINING TRACK SECTIONS AND FASTENED TO THE TRACK FLANGES AT BOTH SIDES OF THE WALL OR THE TRACKS SHALL BE BUTTED TIGHT TOGETHER AND FASTENED TO STRUCTURE EITHER SIDE OF THE JOINT.

12. FOR ALL TRACKS USED IN COMPOSITE MEMBERS SUCH AS TRUSSES, POSTS, HEADERS AND JAMBS, THE TRACK MUST BE INSTALLED AS A SINGLE PIECE; NO SPLICING IS PERMITTED.

13. ALL SCREWS SHALL BE OF THE DIAMETER AND SIZE INDICATED ON THE DRAWINGS, AND SHALL BE THOSE MANUFACTURED AND TESTED BY ITW BUILDEX OR EQUIVALENT. A MINIMUM ½ INCH EDGE DISTANCE AND 1/2 INCH SCREW SPACING IS REQUIRED, UNLESS NOTED OTHERWISE ON THE DRAWINGS. SCREW PENETRATION THROUGH JOINED MATERIALS SHALL NOT BE LESS THAN THREE EXPOSED THREADS. SCREW DESIGN IS BASED ON A TYPE 'T3' SCREW. (UNLESS NOTED OTHERWISE)

14. ALL POWDER ACTUATED FASTENERS (P.A.F.) SUBJECTED TO TENSION SHALL HAVE A 15MM (MINIMUM) DIAMETER STEEL WASHERS. THE FOLLOWING MINIMUM EDGE DISTANCES AND FASTENER SPACING APPLY:

	EDGE DISTANCE		MINIMUM SPACING		PENETRATION	
PIN DIAMETER	STEEL.	CONCRETE.	STEEL.	CONCRETE.	STEEL	CONCRETE.
0.157"ø	1/2"	3"	1"	4"	FULL	1.1/4"

CONCRETE MASONRY:

1. THE **GENERAL CONTRACTOR, PROJECT SUPERINTENDENT AND THE MASONRY FOREMAN** SHALL MEET WITH THE STRUCTURAL ENGINEER PRIOR TO THE START OF MASONRY WORK TO REVIEW PROJECT REQUIREMENTS AND PROCEDURES.

2. AN INDEPENDENT TESTING LAB SHALL VERIFY PLACEMENT OF VERTICAL REINFORCING IN WALLS AND HORIZONTAL REINFORCING IN BOND BEAMS AND LINTELS PRIOR TO PLACEMENT OF GROUT. INDEPENDENT TESTING LAB SHALL PROVIDE CONTINUOUS VISUAL OBSERVATIONS OF GROUTING PROCEDURES, REBAR PLACEMENT, SITE MIXING OF MORTAR, INSTALLATION OF EMBEDED STEEL CONNECTORS, AND GENERAL PLACEMENT OF MASONRY UNITS AND MORTAR JOINTS. INSPECTION REPORTS ARE TO BE GENERATED DAILY BY THE TESTING LAB. INSPECTION SUMMARY REPORTS SHALL BE EMAILED TO THE STRUCTURAL ENGINEER IN ELECTRONIC (PDF) FORMAT.

3. ALL CONCRETE MASONRY SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL BUILDING CODES AND THE MASONRY SOCIETY (TMS 402). DESIGN IS BASED ON MASONRY COMPRESSIVE STRENGTH (f'm) OF 2,000 PSI.

4. HOT AND COLD WEATHER CONSTRUCTION PROCEDURES SHALL BE UTILIZED AS REQUIRED BY THE SPECIFICATIONS AND TMS 602.

5. HOLLOW CONCRETE MASONRY UNITS SHALL BE DOMESTIC LIGHTWEIGHT MOISTURE CONTROLLED TYPE I UNITS, CONFORMING TO ASTM C-90.

6. MASONRY UNITS SHALL HAVE A MINIMUM AVERAGE COMPRESSIVE STRENGTH OF 2,000 PSI (NET AREA) WHEN TESTED IN ACCORDANCE WITH ASTM C-140, "METHODS OF SAMPLING AND TESTING CONCRETE MASONRY UNITS".

7. MORTAR PROPORTIONS FOR REINFORCED MASONRY SHALL BE ESTABLISHED PER ASTM C270 PROPORTION SPECIFICATIONS, TYPE S USING MASONRY CEMENT.

8. GROUT FOR ALL REINFORCED HOLLOW MASONRY UNIT WALLS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI WITH A MAXIMUM 3/8" AGGREGATE. A MID RANGE WATER REDUCING AGENT SUCH AS "POLYHEED"(MASTER BUILDERS) SHALL BE USED. SLUMP TO BE BETWEEN 8 AND 11 INCHES. **ALL GROUT SHALL BE PUMPED.** PLACING OF GROUT TO FOLLOW AMERICAN CONCRETE INSTITUTE (ACI) RECOMMENDATIONS REGARDING **LOW & HIGH LIFT GROUTING**. MAXIMUM LIFT OF GROUT SHALL NOT EXCEED 5'-0" UNLESS APPROVED BY THE ENGINEER PRIOR TO START OF GROUTING. GROUT TO BE TESTED BY A QUALIFIED TESTING LABORATORY AT A RATE OF ONE TEST PER 25 CY OF GROUT IN ACCORDANCE WITH ASTM C1019.

CONCRETE MASONRY CONTINUED:

9. REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60. ALL BAR REINFORCING SHALL BE LAPPED 48 BAR DIAMETERS (MIN). BARS SHALL BE PLACED WITHIN 1/2" OF LOCATION SHOWN IN STRUCTURAL PLANS. BARS SHALL BE HELD IN POSITION DURING GROUTING WITH BAR POSITIONERS. POSITIONERS SHALL BE LOCATED AT THE BOTTOM AND TOP OF THE WALL AND AT 8 TO 10 FOOT INTERVALS. BARS SPLICED BY NON-CONTACT LAP SPLICES SHALL NOT BE SPACED TRANSVERSELY FARTHER APART THAN ONE-FIFTH THE REQUIRED LENGTH OF LAP NOR MORE THAN 8 INCHES.

10. VERTICAL BARS SHALL EXTEND TO THE TOP OF THE PARAPET WALL OR BOND BEAM WHEN A 16" DEEP BEAM IS SPECIFIED. HOOKED DOWELS SHALL BE PROVIDED AT ROOF BOND BEAMS (W/O PARAPETS) LESS THAN 16" DEEP. DOWELS SHALL BE 30" LONG WITH 12" HOOKS.

11. ALL EXTERIOR MASONRY WALLS SHALL BE REINFORCED WITH 9 GA. HOT DIPPED GALVANIZED HORIZONTAL WIRE REINFORCEMENT (LADDER TYPE) EMBEDDED IN MORTAR JOINTS AT 16" O.C. NOMINALWIDTH OF JOINT REINFORCING SHALL EQUAL WALL THICKNESS. (INTERIOR WALLS MAY BE MILL GALVANIZED). WIRE REINFORCEMENT SHALL CONFORM TO ASTM DESIGNATION A-82, AND SHALL BE LAPPED AT LEAST 8" WITH AT LEAST ONE CROSS WIRE WITHIN THE LAP. JOINT REINFORCING SHALL BE INSTALLED IN THE FIRST AND SECOND MORTAR BED JOINTS IMMEDIATELY ABOVE AND BELOW ALL OPENINGS. WIRE REINFORCING SHALL BE DISCONTINUOUS AT CONTROL JOINTS.

12. EXTERIOR WALLS SHALL BE BONDED WITH CONCRETE MASONRY UNITS AT BUILDING CORNERS.

13. ONE GROUTED #5 BAR SHALL BE PROVIDED AROUND THE PERIMETER OF ALL WALL OPENINGS AND AT BUILDING CORNERS UNLESS NOTED OTHERWISE ON THE STRUCTURAL PLANS.

14. NEATLY TOOL INTERIOR AND EXTERIOR JOINTS IN MASONRY TO FORM A SLIGHTLY CONCAVE PROFILE WHEN MORTAR IS THUMBPRINT HARD UNLESS SHOWN OTHERWISE. ALL MORTAR JOINTS SHALL BE TOOLED THE ENTIRE HEIGHT OF WALL.

15. BOND BEAMS SHALL BE REINFORCED WITH TWO CONTINUOUS #5 BARS UNLESS NOTED OTHERWISE ON THE STRUCTURAL PLANS. REINFORCING SHALL BE CONTINUOUS AT ALL CORNERS AND INTERSECTING WALLS. (PROVIDE CORNER BARS). WHERE SIDE WALL AND END WALL BOND BEAMS DO NOT COURSE CONTINUE THE LOWER BOND BEAM AROUND THE BUILDING CORNER TO THE FIRST VERTICAL REINFORCED CELL.

16. CONTROL JOINTS SHALL BE CONSTRUCTED WITH SLOTTED MASONRY UNITS AND FACTORY MOLDED JOINT FILLER.JOINTS SHALL BE CAULKED WITH AN APPROVED MATERIAL. JOINTS SHALL BE PROVIDED AT MAXIMUM SPACING OF 22 FT. AND AT ALL LOCATIONS WHERE COLUMNS ARE PLACED IN CMU CELLS. (EXTERIOR AND INTERIOR WALLS). JOINT LOCATIONS, IF NOT SHOWN ON PLANS, SHALL BE COORDINATED WITH ARCHITECT.

17. CONTROL JOINTS **SHALL NOT** EXTEND THROUGH BOND BEAMS UNLESS INDICATED ON THE STRUCTURAL PLANS.

18. CONTROL JOINTS IN CMU WALLS SHALL NOT BE LOCATED CLOSER THAN 2'-0" FROM THE EDGE OF OPENING WITHOUT REVIEW OF STRUCTURAL ENGINEER.

19. COLUMNS WHICH EXTEND THROUGH BOND BEAMS SHALL BE WRAPPED WITH 2 LAYERS OF 30# BUILDING PAPER. REINFORCING SHALL BE CONTINUOUS PAST COLUMNS WHEN ADEQUATE CLEARANCE EXISTS.

20. LINTELS OVER ALL OPENINGS IN INTERIOR MASONRY PARTITIONS, NOT OTHERWISE COVERED, ARE TO BE OF STANDARD CMU LINTEL BLOCK WITH THICKNESS EQUAL TO WALL THICKNESS. DEPTH SHALL BE 8" FOR OPENINGS UP TO 6'-0", REINFORCED WITH TWO #5'S, LOCATED 2-1/2" ABOVE THE BOTTOM EXTERIOR FACE OF THE UNIT.

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 RATINGS TO ARCHITECT. TO MEET THE WIND PRESSURES CALCULATED PER ASCE 7-16 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).

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. FM 4450 – APPROVAL STANDARD FOR CLASS 1 INSULATED STEEL DECK ROOFS

   D. FM 4474 – AMERICAN NATIONAL STANDARD FOR EVALUATING THE SIMULATED WIND UPLIFT RESISTANCE OF ROOF ASSEMBLIES USING STATIC POSITIVE AND/OR NEGATIVE DIFFERENTIAL PRESSURES

   E. UL 580 – STANDARD FOR TESTS FOR UPLIFT RESISTANCE OF ROOF ASSEMBLIES

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SOUTH TEXAS I.S.D. - MERCEDES
SCI CTE AUTOMOTIVE EXPANSION 2025
MERCEDES , TEXAS

STATE OF TEXAS
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GENERAL STRUCTURAL NOTES

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) SHOP DRAWINGS SHALL INCLUDE A ROOF ZONE DIAGRAM SPECIFIC TO THE PROJECT. ROOF ZONE DIAGRAM SHALL INCLUDE DIMENSIONS FOR ALL ZONES FOLLOWING PARAMETERS SPECIFIED ON THE CONTRACT DRAWINGS.
7) 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.
8) 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.

B. 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 2018. 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 2018.

CONTINUOUS OR PERIODIC SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING WORK:

REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
VERIFY SOILS BELOW SHALLOW FOUNDATIONS ARE SUITABLE TO ACHEIVE THE BEARING CAPACITY FOR WHICH THEY WERE DESIGNED		X
VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL		X
PERFORM CLASSIFICATION AND TESTING OF COMPACTED SELECT FILL MATERIALS		X
VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF SELECT FILL	X	
PRIOR TO PLACEMENT OF COMPACTED SELECT FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY		X

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	X
INSPECTION OF PRESTRESSED CONCRETE APPLICATION OF PRESTRESSING FORCES AND GROUTING OF BONDED PRESTRESSING TENDONS		
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 LEVEL 3 SPECIAL INSPECTION OF MASONRY CONSTRUCTION (RISK CATEGORY IV)

INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
1.AS MASONRY CONSTRUCTION BEGINS VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE:		
a. PROPORTIONS OF SITE-PREPARED MORTAR		X
b. GRADE, TYPE AND SIZE OF REINFORCEMENT, CONNECTORS, ANCHOR BOLTS, AND PRESTRESSING TENDONS AND ANCHORAGES		X
2.PRIOR TO GROUTING, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE		
a. GROUT SPACE	X	
b. PLACEMENT OF REINFORCEMENT, CONNECTORS, AND ANCHOR BOLTS	X	
3.VERIFY COMPLIANCE OF THE FOLLOWING DURING CONSTUCTION:		
a. MATERIALS AND PROCEDURES WITH THE APPROVED SUBMITTALS		X
b. PLACEMENT OF MASONRY UNITS AND MORTAR JOINT CONSTRUCTION		X
c. SIZE AND LOCATION OF STRUCTURAL MEMBERS		X
d. TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION	X	
e. PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER(TEMPERATURE BELOW 40°F(4.4°C)) OR HOT WEATHER(TEMPERATURE ABOVE 90°F(32.2°))		X
f. PLACEMENT OF GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS IS IN COMPLIANCE	X	
4.OBSERVE PREPARATION OF GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS	X	

REQUIRED VERIFICATION AND INSPECTION OF ANCHORS

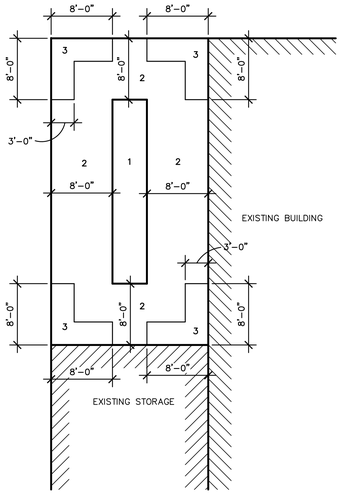
VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC
CAST-IN-PLACE, POST-INSTALLED, MECHANICAL AND EPOXY SET ANCHORS: AS APPLICABLE, THE INSPECTION PROGRAM SHALL VERIFY THE ANCHOR TYPE, EMBEDMENT, TIGHTENING TORQUE, DIMENSIONS, HOLE DEPTH & DIAMETER AND CLEANOUT, EPOXY MIXING AND PLACEMENT PROCEDURES IN ACCORDANCE 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 AND ORIENTATION, WHICHEVER IS MORE STRINGENT	

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 COLD-FORMED LIGHTWEIGHT STEEL FRAME CONSTRUCTION (EXTERIOR METAL STUDS)

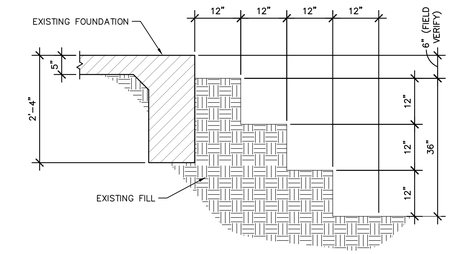
VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
MATERIAL VERIFICATION OF COLD-FORMED LIGHTWEIGHT FRAMING MEMBERS AND ACCESSORIES		X
TYPE, SIZE AND GAGE OF FRAMING MEMBERS AND ACCESSORIES (AS PER SHOP DRAWINGS)		X
SPACING OF FRAMING MEMBERS, BRACING, BLOCKING, AND BRIDGING (AS PER SHOP DRAWNGS)		X
INSPECTION OF WELDING; TYPE, LENGTH, SPACING (AS PER SHOP DRAWNGS)		X
INSPECTION OF FASTENER ATTACHMENT: BOLTING, ANCHORING, AND OTHER FASTENING OF COMPONENTS.		X



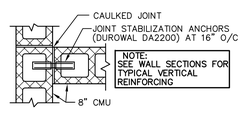
STISD-MERCEDES VOCATIONAL
CTE CAMPUS REVONATION
ROOF DESIGN WIND PRESSURE (SERVICE)

DESIGN WIND PRESSURE FOR ROOF COMPONENTS & CLADDING	
ZONE	P- (UPLIFT)
1	-34 PSF
2	-50 PSF
3	-68 PSF

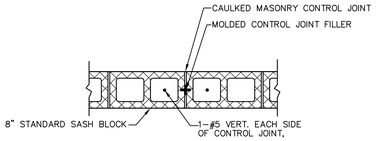
EXTERIOR FINISHES, DOORS & WINDOWS MAXIMUM DESIGN WIND PRESSURES
P+ = +22 PSF TOWARDS THE SURFACE
P- = -29 PSF AWAY FROM THE SURFACE



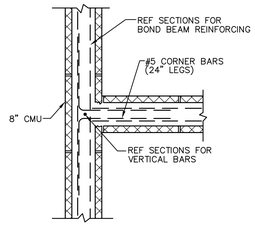
1 TYPICAL SITE EXCAVATION DETAIL UP AGAINST EXISTING PERIMETER GRADE BEAM



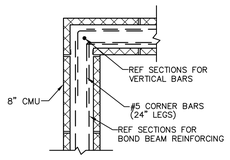
1 TYPICAL UNBONDED WALL INTERSECTION



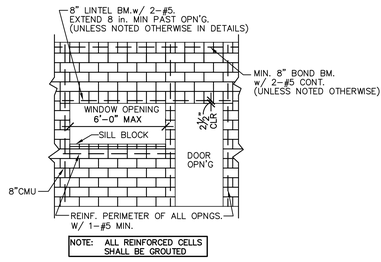
2 TYPICAL CRACK CONTROL JOINT



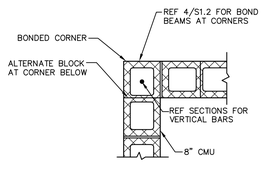
3 TYPICAL BOND BEAM AT INTERSECTING WALL



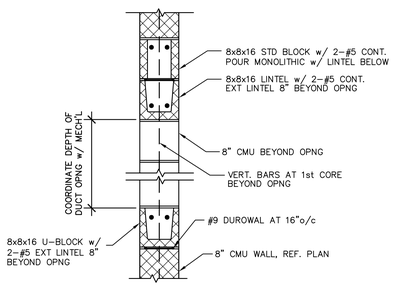
4 BOND BEAM AT EXTERIOR CORNERS



5 TYPICAL REINFORCING AT OPENINGS
(NON LOAD-BEARING WALLS ONLY)



6 BONDED CORNER



7 TYPICAL LOUVER OPENING THRU 8" CMU WALL

NOTE:

1. COORDINATE LOUVER LOCATIONS WITH MEP AND ARCH'L.

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MERCEDES , TEXAS

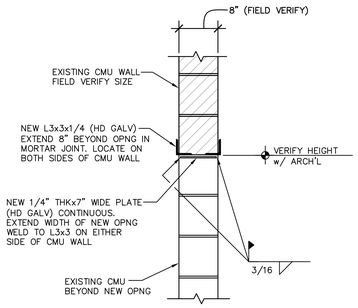


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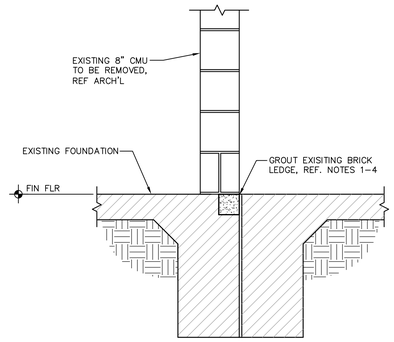
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1 TYPICAL LINTEL SUPPORT FRAMING AT NEW OPENINGS IN EXISTING MASONRY WALLS

NOTE:

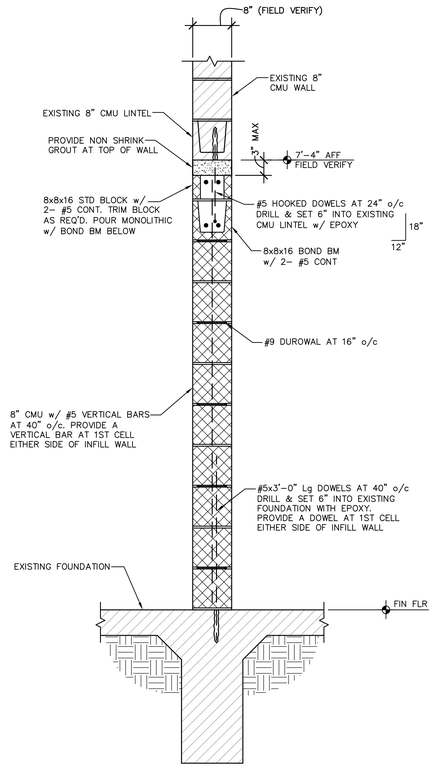
1. COORDINATE NEW OPENING LOCATIONS IN EXISTING MASONRY WALLS w/ ARCHITECTURAL.



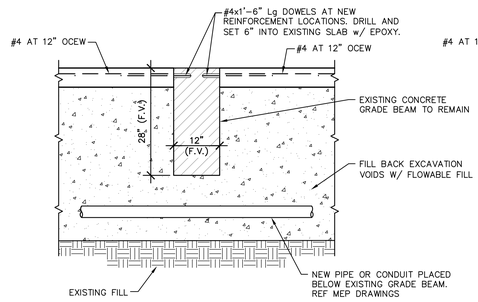
2 TYPICAL INFILL LEDGE

TOPPING NOTES:

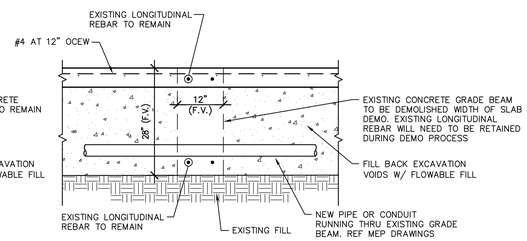
1. EXISTING CONCRETE SHALL BE CLEANED OF DIRT, GREASE, PAINT, AND LOOSE OR SCALED CONCRETE. ONCE CLEAN THE CONCRETE SHALL BE CHEMICALLY WASHED WITH A 10% HYDROCHLORIC ACID SOLUTION.
2. SCARIFY SURFACE TO PROVIDE A 1/8" DEEP GROOVED SURFACE. ONCE SCARIFIED CLEAN AND FLUSH SURFACE WITH WATER.
3. HAND BRUSH A PRIMER COAT OF PORTLAND CEMENT PASTE ON PREPARED SURFACE OF EXISTING CONCRETE.
4. GROUT TOPPING SHALL HAVE A WC RATION OF 0.5% WITH A MAX COARSE AGGREGATE OF 3/8".



3 TYPICAL MASONRY INFILL DETAIL AT INTERIOR WALLS



OPTION 1 IF NEW PLUMBING LINES RUN BELOW EXISTING GRADE BEAM

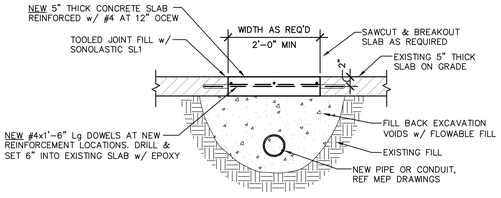


OPTION 2 IF NEW PLUMBING LINES RUN THRU EXISTING GRADE BEAM

4

NOTES:

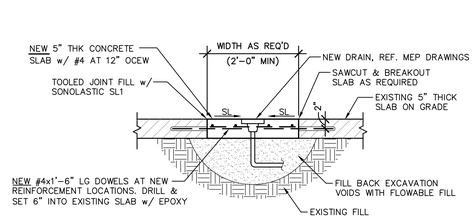
1. CONTRACTOR TO COORDINATE LOCATIONS OF INTERIOR GRADE BEAMS IN THE FIELD.



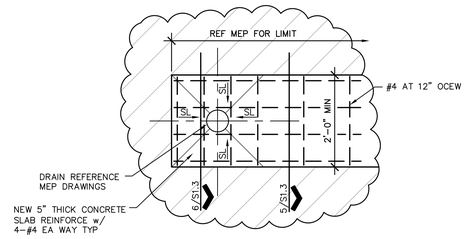
5 TYPICAL UTILITY TRENCH DETAIL

NOTES:

1. COORDINATE UTILITY TRENCH LOCATION WITH MEP DRAWNGS.



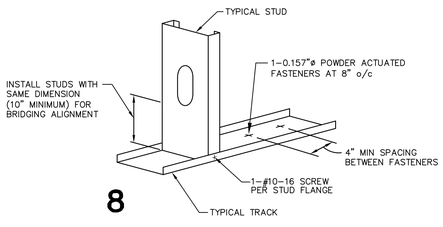
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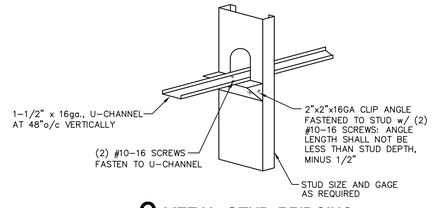
7 TYPICAL DRAIN DETAIL

NOTES:

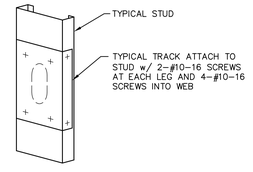
1. COORDINATE LOCATION w/ MEP DRAWINGS.



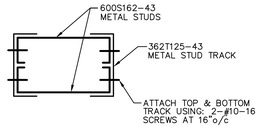
8



9 METAL STUD BRIDGING



10 TYPICAL PUNCH-OUT REINFORCMENT DETAIL



11 TYPICAL METAL STUD BOX HEADER

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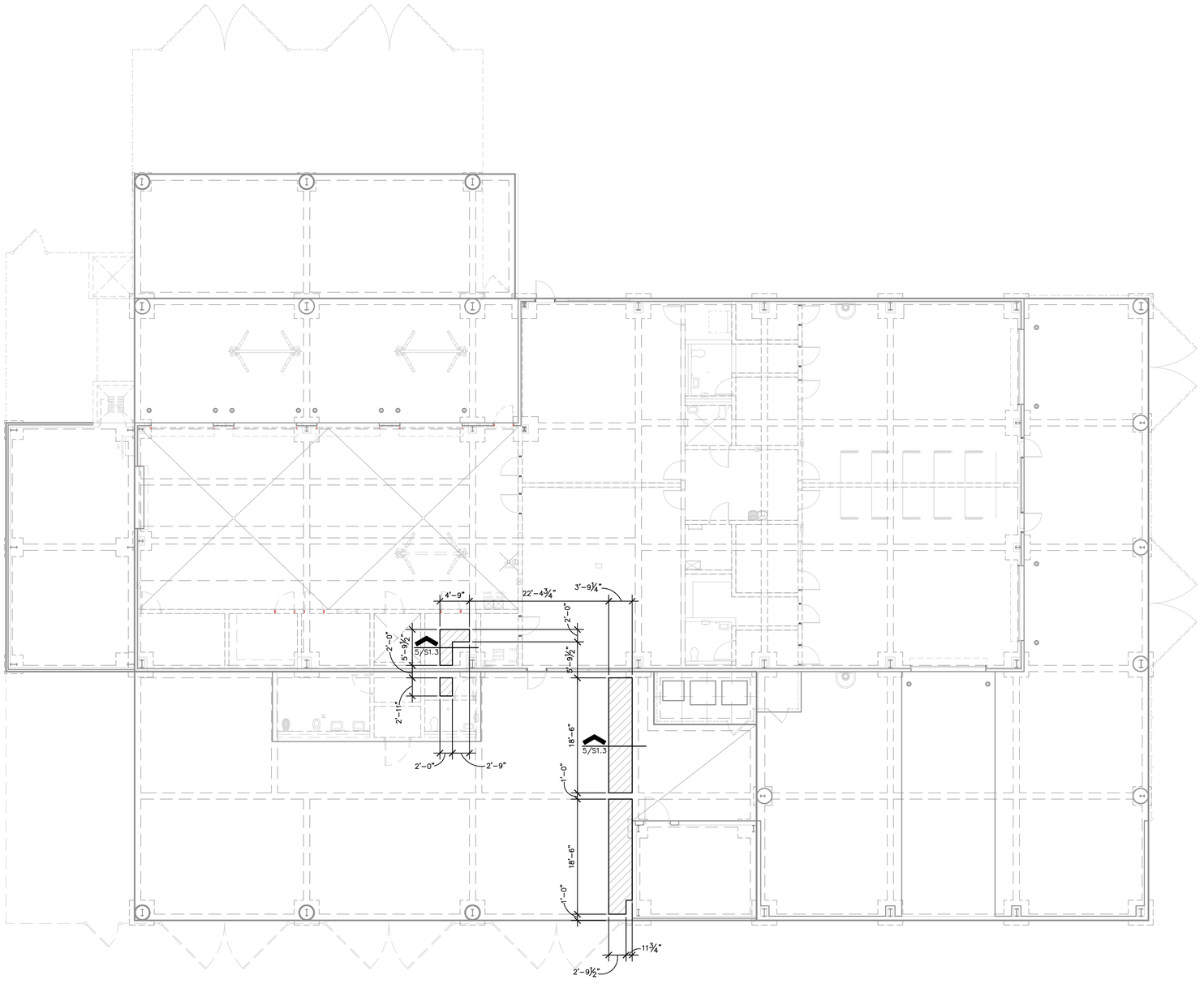
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1 DEMOLITION FOUNDATION PLAN

1/8" = 1'-0"

N

PLAN NORTH

NOTES:

1. EXISTING FOUNDATION LAYOUT IS BASED ON STRUCTURAL RECORD DRAWINGS TITLED SOUTH TEXAS INDEPENDENT SCHOOL DISTRICT THE SCIENCE ACADEMY OF SOUTH TEXAS VOCATIONAL, SHEET S2.1, DATED NOVEMBER 17th, 2006 BY GREEN, RUBIANO & ASSOCIATES, AND DRAWING TITLED SOUTH TEXAS I.S.D. MERCEDES VOCATIONAL BUILDING RENOVATIONS, SHEET S2.1, DATED AUGUST 14TH, 2020 BY GREEN, RUBIANO & ASSOCIATES. REFER TO RECORD DRAWINGS FOR ADDITIONAL INFORMATION.
2. ▨ INDICATES LOCATIONS WHERE EXISTING 5" (FIELD VERIFY) THICK CONCRETE SLAB WILL NEED TO BE SAWCUT AND DEMOLISHED TO INSTALL NEW UNDERGROUND UTILITIES. FINAL LOCATION OF NEW UNDERGROUND UTILITIES WILL NEED TO BE COORDINATED WITH MEP.
3. CONTRACTOR SHALL COORDINATE LIMITS OF EXISTING SLAB DEMOLITION WITH M.E.P.
4. COORDINATE ADDITIONAL DEMOLITION SCOPE WITH ARCHITECTURAL.

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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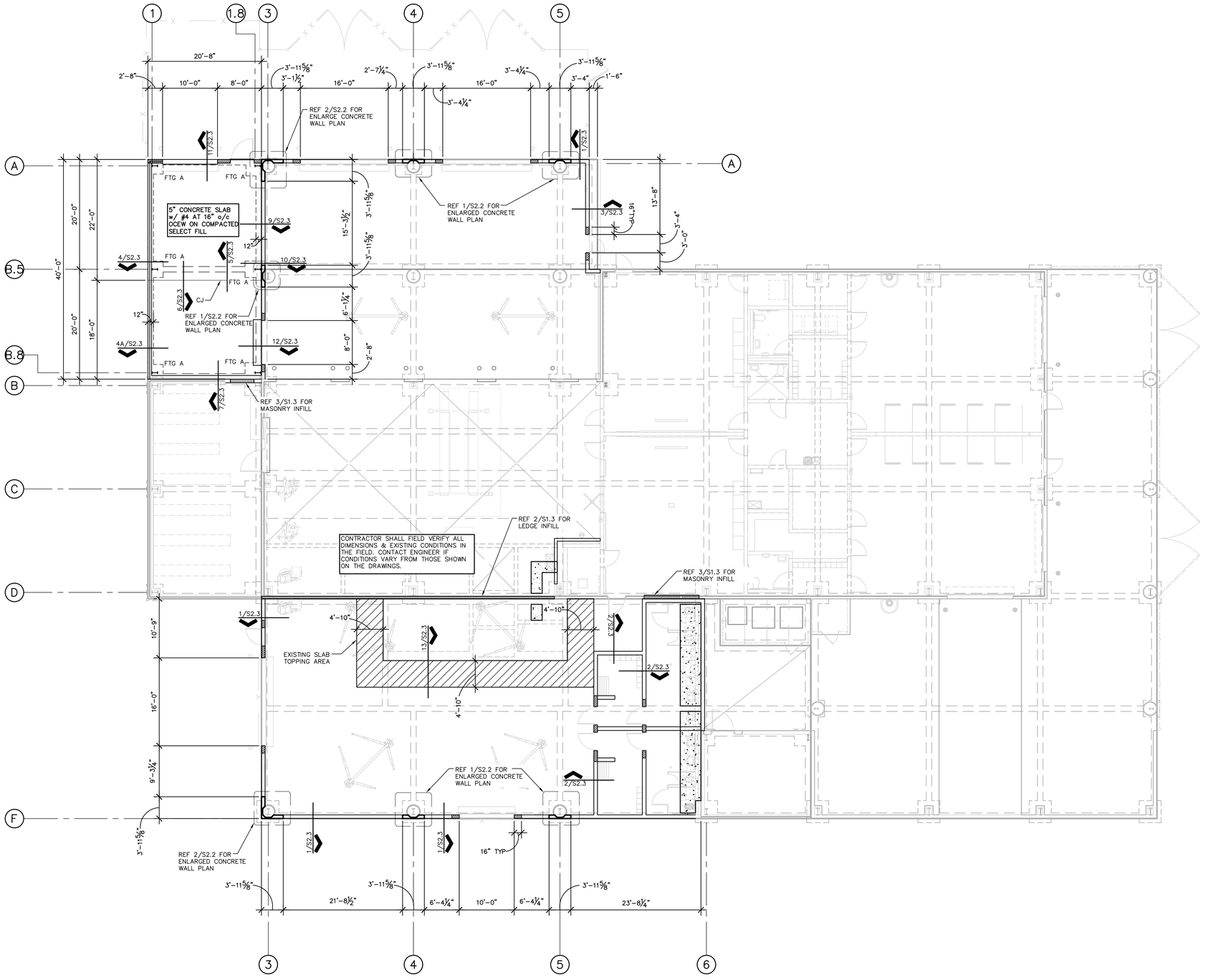
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1 RENOVATED FOUNDATION PLAN

1/8" = 1'-0"

BASE BID, ALTERNATE #1 & ALTERNATE #2

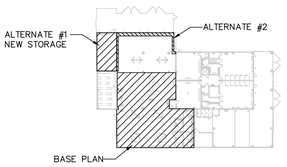
N

PLAN NORTH

FOOTING SCHEDULE		
MARK	SIZE	REINFORCEMENT
FTG A	3'-0" x 3'-0"	#5 AT 12" O.C.E.W.

NOTES:

1. REFERENCE PRE-ENGINEERED BUILDING ANCHOR BOLT PLAN FOR BOLT DIAMETER AND LOCATION. COLUMN ANCHOR BOLT LENGTHS TO BE DETERMINED BY STRUCTURAL ENGINEER SUBSEQUENT TO RECEIPT AND REVIEW OF THE BUILDING REACTION DIAGRAMS AND ANCHOR BOLT PLAN.
2. REFERENCE ROOF FRAMING PLAN FOR COLUMN AB/BASE PLATE LOCATIONS. FOUNDATION PLAN DIMENSIONS GENERALLY DENOTES GRADE BEAM CENTERLINE AND OUTSIDE FACE OF CONCRETE.
3. ALL CONDUIT GREATER THAN 1.1/2" IN DIAMETER SHALL BE RECESSED TO PROVIDE 1.1/2" CLEAR DISTANCE BETWEEN SLAB REBAR & CONDUIT.
4. MAINTAIN 2" MINIMUM CLEAR DISTANCE BETWEEN ALL CONDUIT IN SLAB.
5. A SINGLE CONDUIT (MAX 3" OD) MAY BE PLACED WITHIN THE BEAM CAGE. ALL CONDUIT IN BEAM CAGES TO BE TIED TO STIRRUPS MINIMUM OF 4" FROM HORIZONTAL BARS.
6. CRACK CONTROL JOINTS ARE NOTED ON THE PLANS. CONTRACTOR TO COORDINATE CHANGES WITH THE ENGINEER PRIOR TO FORMING FOUNDATION.
7. PLUMBING LINES PASSING THROUGH GRADE BEAMS SHALL BE SLEEVED. BEAMS SHALL BE DEEPENED AND BENT REBAR PROVIDED IF LOCATION OF DRAIN LINES REQUIRES CUTTING BOTTOM BARS. REFERENCE DETAIL 8/S2.3.
8. ALL JOINTS TO BE CLEANED AND FILLED w/ SONOLASTIC SL1 (SONNEBORN) WITHIN 48 HOURS AFTER SAWCUTTING SLAB.
9. INDICATES 8" CMU w/ 1-#5 VERTICAL BARS AT 8" o/c.
10. INDICATES LIMIT OF NEW 5" THICK SLAB FOR PLUMBING SAWCUT. REFERENCE DS2.1 FOR LIMITS OF SLAB OPENING.
11. INDICATES LIMIT OF TOPPING REF DETAIL 13/S2.3



KEY PLAN

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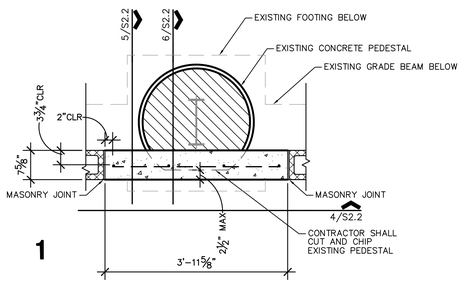
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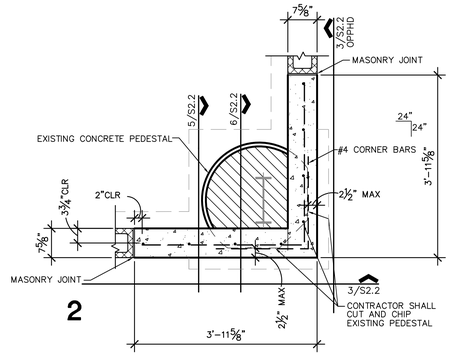
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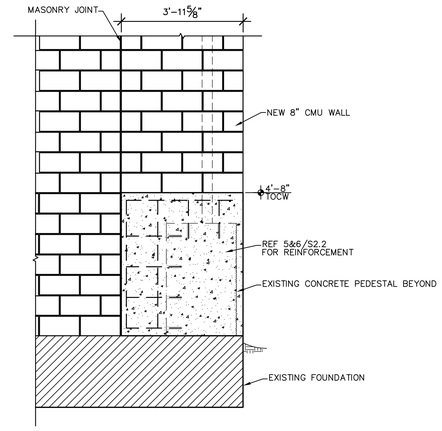
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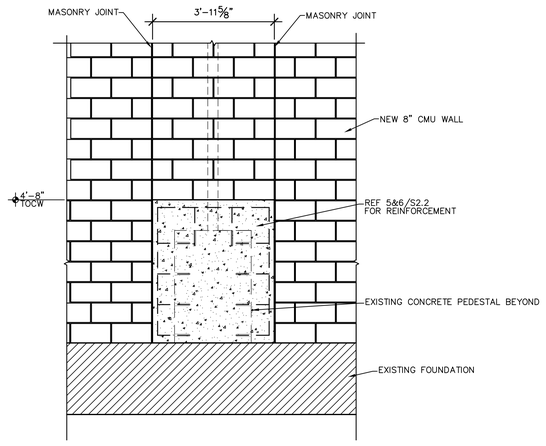
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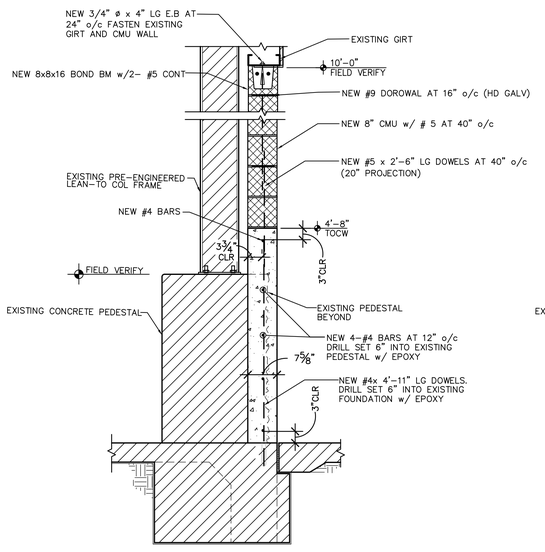
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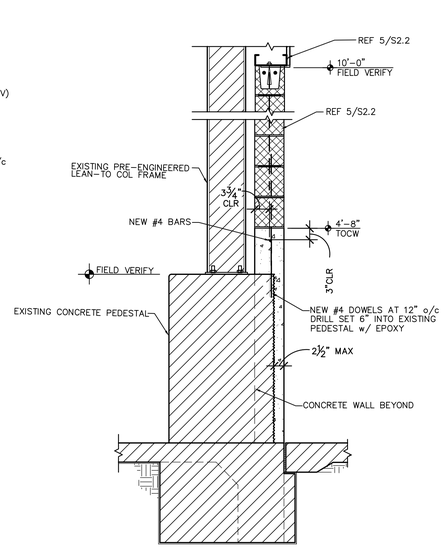
3 TYPICAL CONCRETE WALL CORNER ELEVATION



4 TYPICAL CONCRETE WALL ELEVATION



5



6

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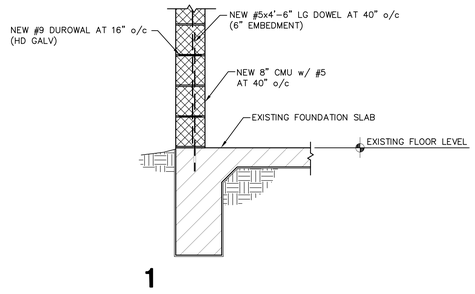
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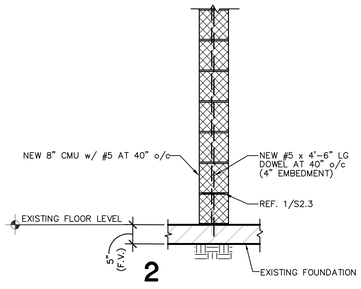
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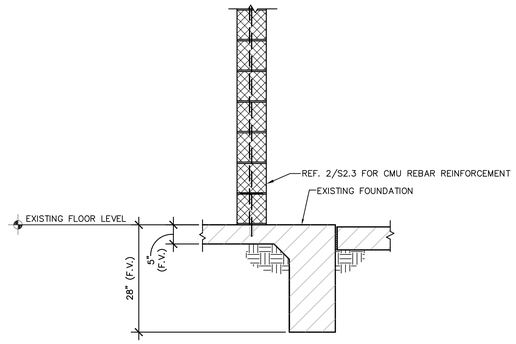
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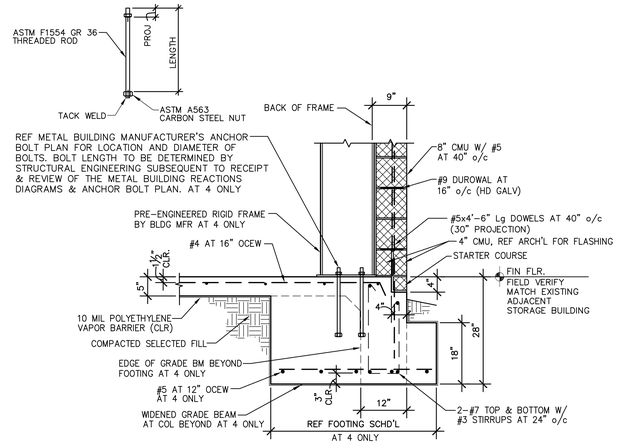
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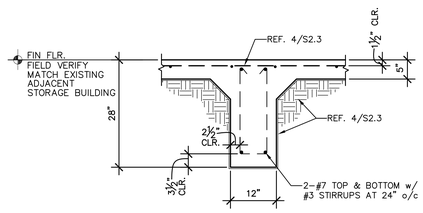
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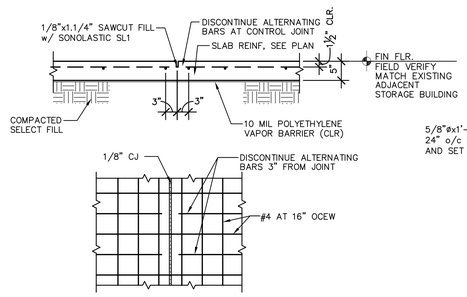
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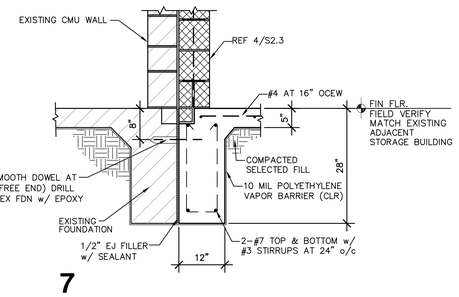


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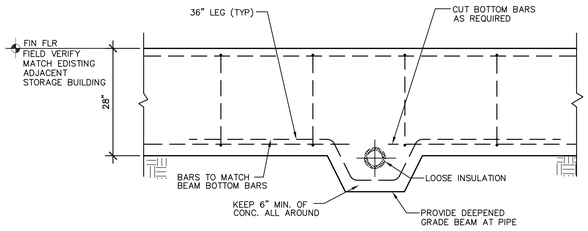


6 **CONTROL JOINT**

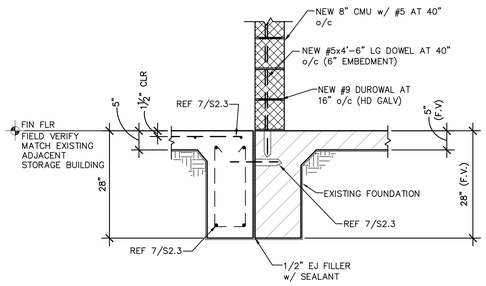
NOTE: ALL JOINTS ARE TO BE CLEANED AND FILLED WITH SONOLASTIC SL1 (SONNEBORN) WITHIN 48 HOURS AFTER SAWCUTTING SLAB.



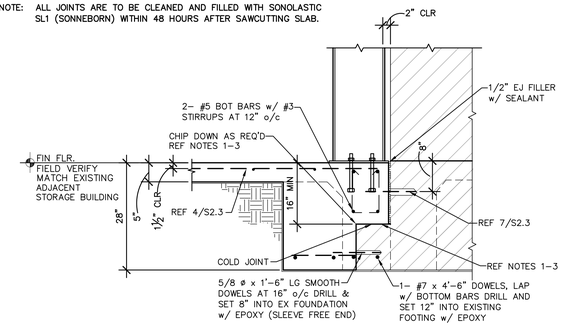
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8 **TOP OF SLEEVE INTERRUPTS REINFORCING**



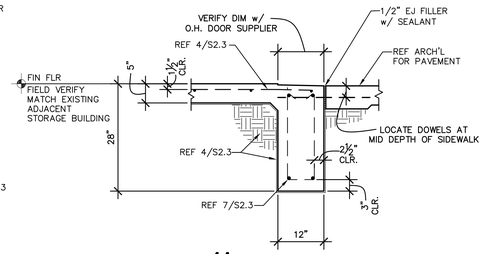
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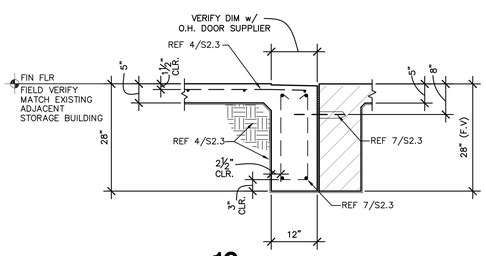
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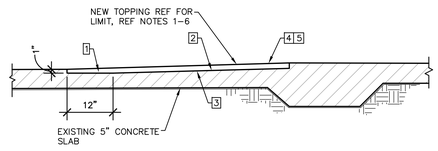
1. SCARIFY SURFACE OF EXISTING CONCRETE TO PROVIDE 1/8" DEEP GROOVED SURFACE.
2. CHIP AND REMOVE EXISTING CONCRETE AS REQUIRED TO PROVIDE 3" CLEARANCE AROUND NEW REINFORCEMENT.
3. SURFACE SHALL BE CLEANED OF DIRT AND LOOSE CONCRETE PRIOR TO POURING NEW CONCRETE.



11



12



13 TOPPING DETAIL WORK SEQUENCER:

1. CUT AND CHIP A MINIMUM OF 1" OF EXISTING SLAB SURFACE, TO PROVIDE MINIMUM TOPPING THICKNESS AT LOW END OF SLOPPED TOPPING SURFACE.
2. SCARIFY AND TEXTURE EXPOSED CONCRETE SURFACE TO PRODUCE A CSP5-7 IN ACCORDANCE w/ ICRI GUIDELINE 310-2.
3. PREPARE ROUGHENED SURFACE OF EXPOSED CONCRETE AS DIRECTED BY EUCOCRETE PREPARATION RECOMMENDATION.
4. PLACE MINIMUM 1" THICK EUCOCRETE TOPPING SLAB TO PRODUCE RAMP SURFACE.
5. WET CURE A MINIMUM OF 3 DAYS.

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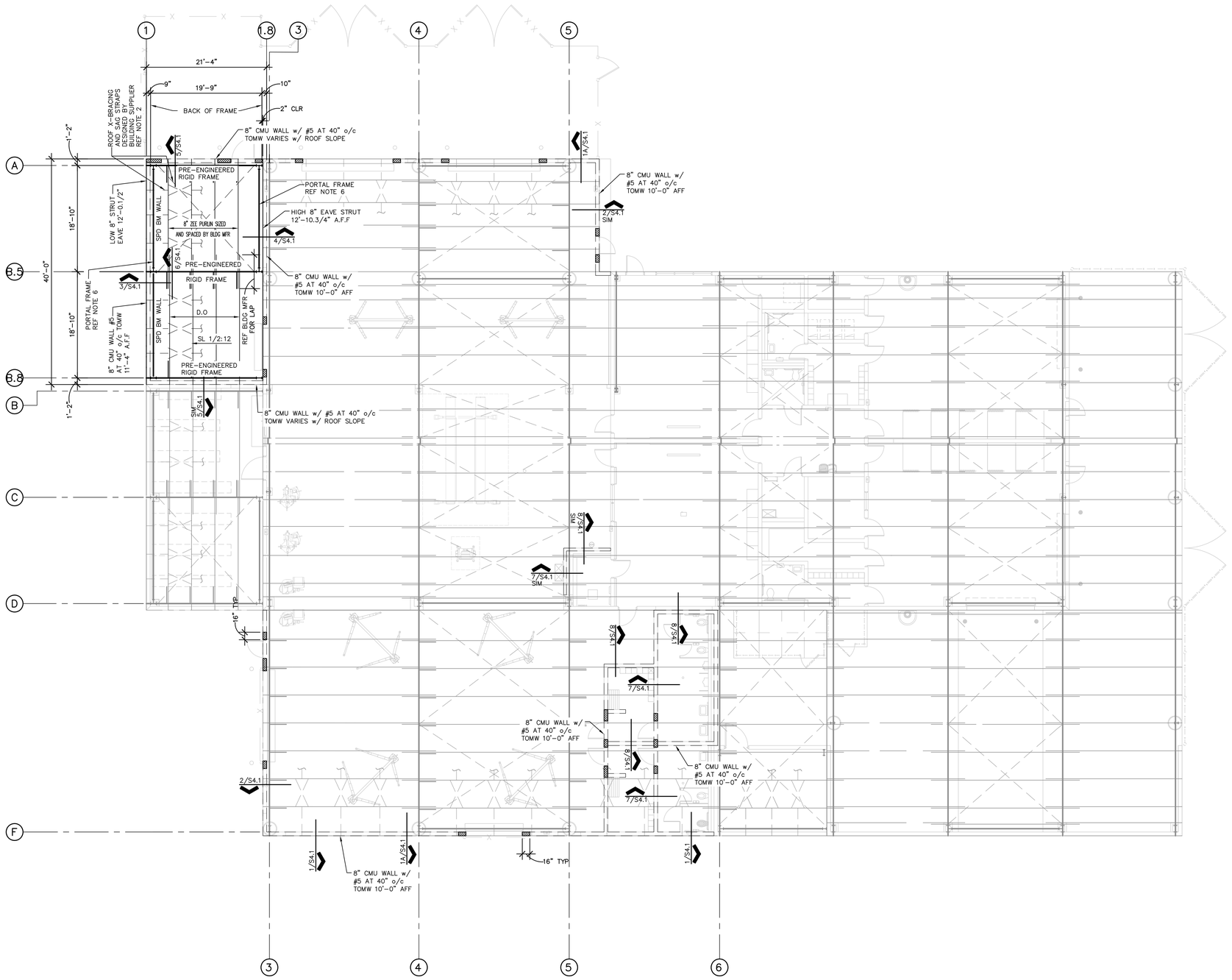
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1 RENOVATED FRAMING PLAN

1/8" = 1'-0"

BASE BID, ALTERNATE #1 & ALTERNATE #2

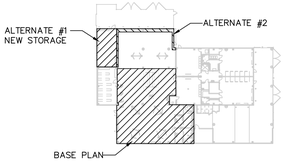
N

PLAN NORTH

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS & EXISTING CONDITIONS IN THE FIELD. CONTACT ENGINEER IF CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS.

NOTES:

1. ALL STRUCTURAL STEEL FRAMING MEMBERS INCLUDING FRAMES, PURLINS, GIRTS, SECONDARY COMPONENTS, FASTENERS AND ASSOCIATED ACCESSORIES SHALL BE PAINTED w/ ONE COAT OF SHOP PRIMER.
2. SCHEMATIC ROOF FRAMING PLAN DEPICTS PRE-ENGINEERED METAL BUILDING COMPONENTS AND INDICATES THE STRUCTURAL ENGINEER'S INTENT PERTAINING TO THE ESTABLISHMENT OF THE STRUCTURAL INTEGRITY OF THE BUILDING.
3. PRE-ENGINEERED METAL BUILDING SUPPLIER MAY UTILIZE STANDARD MEMBERS AND SPACING OF THE ROOF SYSTEM COMPONENTS TO MEET OR EXCEED THE SPECIFIED DESIGN REQUIREMENTS.
4. PRE-ENGINEERED METAL BUILDING SUPPLER SHALL SUBMIT SHOP/ERECTION DRAWINGS AND BUILDING DESIGN CALCULATIONS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.
5. ADDITIONAL PURLIN AND WALL GIRTS SHALL BE PROVIDED AS REQUIRED FOR SUPPORT OF METAL ROOF AND WALL PANELS TO SATISFY POJECT DESIGN WIND PRESSURES.
6. METAL BUILDING DESIGNER TO COORDINATE PORTAL FRAME BEAM AND COLUMN DIMENSIONS WITH ARCHITECTURAL WRAPS AND SIZE TO FIT (12" MAXIMUM COLUMN DEPTH).
7. ▨ INDICATES 8" CMU w/ 1-#5 VERTICAL BARS AT 8" o/c.
8. REFERENCE DETAIL 9/S4.1 FOR TYPICAL GIRT LOUVER OPENING FRAMING DETAIL AT EXISTING BUILDING. REFERENCE ARCHITECTURAL FOR LOCATION.



KEY PLAN

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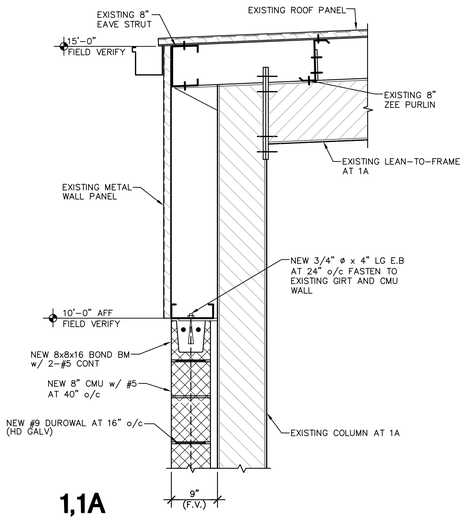
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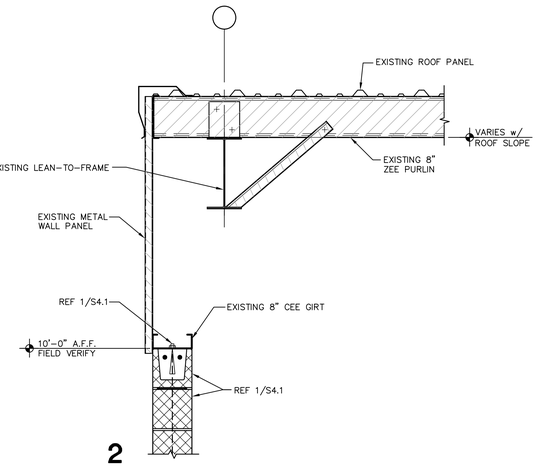
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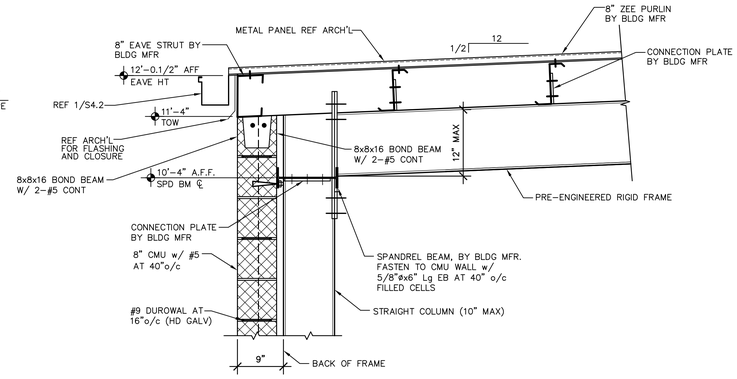
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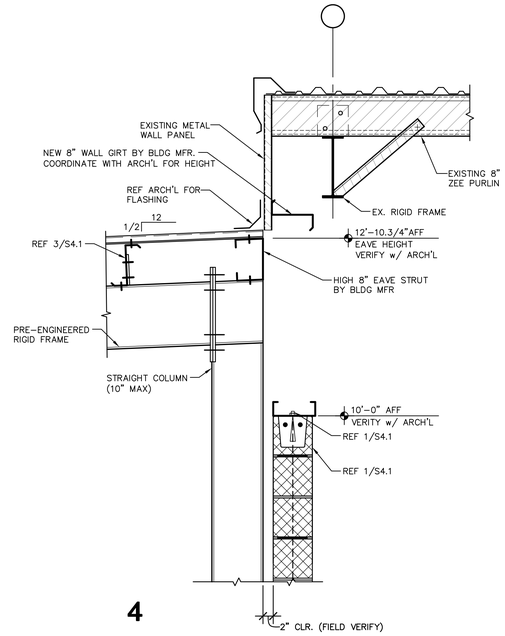
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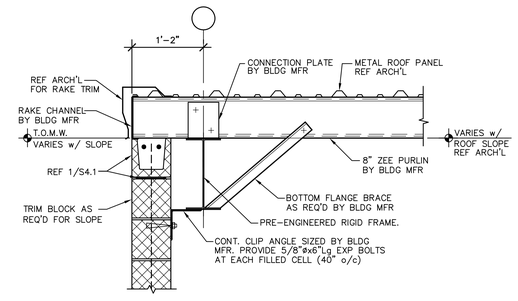
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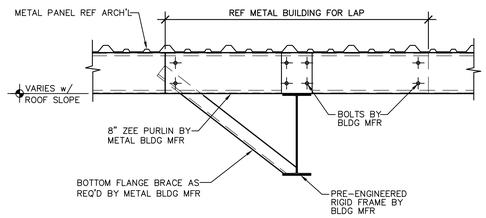
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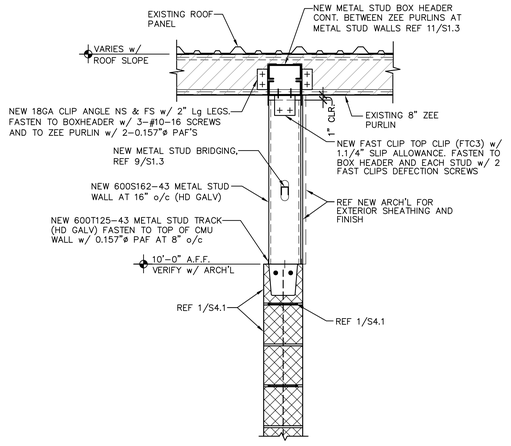
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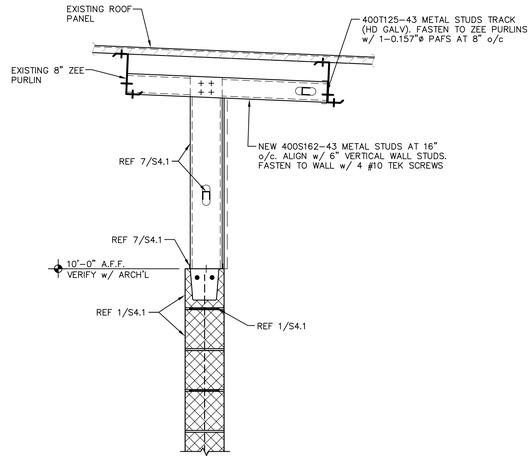
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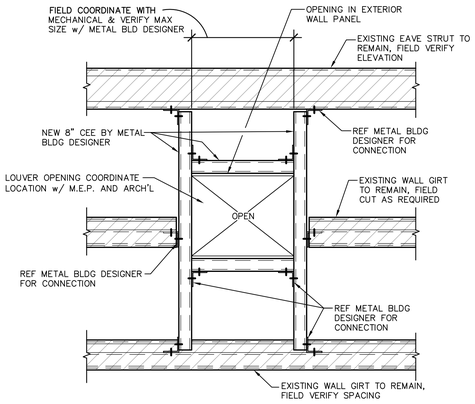
6 FLANGE BRACE DETAIL



7



8



9 TYPICAL GIRT WINDOW AND LOUVER OPNG FRAMING DETAIL

COORDINATE WINDOW & LOUVER OPENING HEIGHT & LOCATION w/ MECHANICAL & ARCHITECTURAL.

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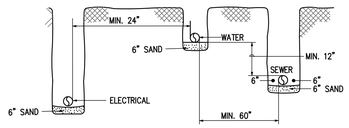
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CLEAR TRENCH OF ALL ROCKS AND DEBRIS BEFORE ADDING SAND CUSHION.

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

MAINTAIN A MINIMUM OF 60 INCHES UNDISTURBED EARTH BETWEEN PARALLEL WATER AND SEWER LINES OR SUPPORT WATER LINE ON SEPARATE SHELF A MINIMUM OF 12" ABOVE SEWER LINE.

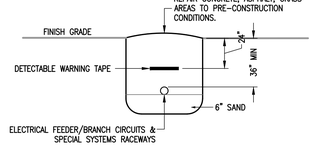
MAINTAIN A MINIMUM OF 24" HORIZONTALLY BETWEEN ELECTRICAL AND SEWER. MAINTAIN A MINIMUM OF 12" VERTICALLY OR 24" HORIZONTALLY BETWEEN ELECTRICAL AND WATER LINES, GAS LINES, TELEPHONE RACEWAYS AND CABLE RACEWAYS.



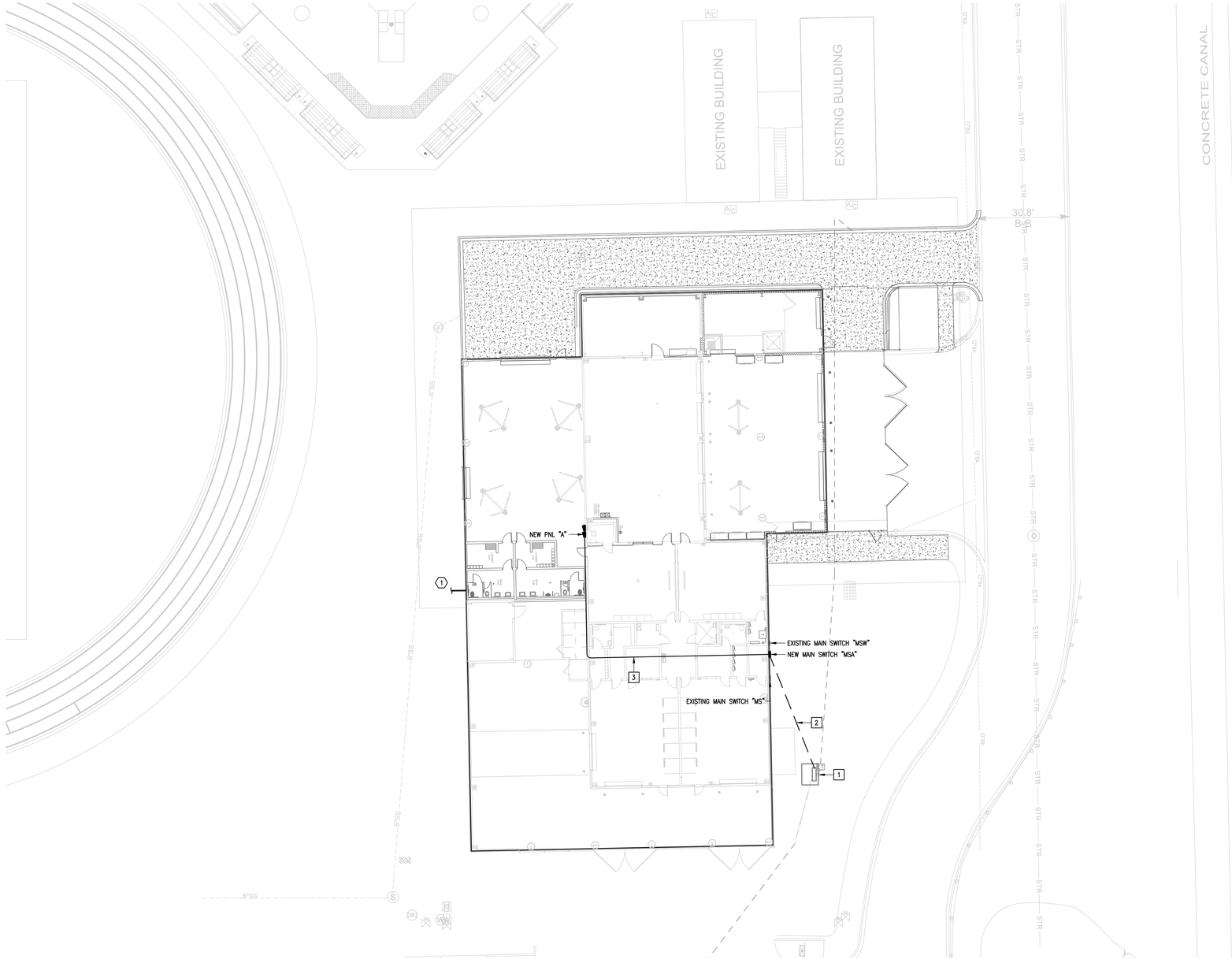
03 TRENCHING DETAIL
SCALE :NONE

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

CROWN TOP FOR FUTURE SETTLING. REPAIR CONCRETE, ASPHALT, GRASS AREAS TO PRE-CONSTRUCTION CONDITIONS.



BURIAL DETAIL FOR ELECTRICAL RACEWAYS
02
SCALE :NONE



01 ELECTRICAL AND PLUMBING SITE PLAN
SCALE : 1/16" = 1'-0"

GENERAL NOTES:

1. 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.
2. FIELD VERIFY PROJECT SITE EXISTING CONDITIONS AND ELEVATIONS PRIOR TO BEGINNING ANY WORK.
3. COORDINATE ELECTRICAL, MECHANICAL AND PLUMBING WITH GENERAL CONSTRUCTION.
4. PHASING AND SEQUENCE OF CONSTRUCTION SHALL BE PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
5. FIELD VERIFY/SPOT EXACT LOCATIONS AND EXISTING CONDITIONS OF EXISTING PLUMBING, AND ELECTRICAL. IT IS THE INTENT OF THESE PLANS TO PROVIDE A COMPLETE AND WORKABLE SYSTEMS. SHOULD BIDDER FIND OMISSIONS OR DISCREPANCIES IN THE PLANS, BIDDER SHALL NOTIFY THE ENGINEER PRIOR TO THE BID DATE AND A WRITTEN CLARIFICATION WILL BE ISSUED.
6. DAMAGED ITEMS SHALL BE REPAIRED AT NO ADDITIONAL COST TO OWNER. CONTRACTORS ARE REQUIRED TO SEARCH AND INVESTIGATE FOR EXISTING UTILITIES BEFORE EXCAVATING.
7. 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.
8. PROVIDE J-BOXES (POLYMER CONCRETE) AS REQUIRED FOR PULL WIRING.
9. ELECTRICAL WIRING SHALL NOT BE SPLICED BELOW GRADE.
10. PERFORM ALL WORK PER LATEST VERSION OF NATIONAL ELECTRICAL CODE, AND APPLICABLE LOCAL CODES AND ORDINANCES, UNLESS DRAWINGS OR SPECIFICATIONS HAVE MORE STRINGENT REQUIREMENTS.
11. CONTRACTOR IS RESPONSIBLE FOR ALL PERMITS AND FEES ASSOCIATED WITH PROJECT, INCLUDING FEES FOR INSPECTIONS, APPLICATIONS, AND PROVISION OF NEW SERVICES.
12. CONTRACTOR WHO WILL ACTUALLY PERFORM WORK MUST APPLY FOR ALL REQUIRED PERMITS.
13. PROVIDE SCH. 40 PVC RACEWAYS UNDERGROUND.
14. COORDINATE ALL WORK WITH OTHER TRADES; COORDINATE SCHEDULE OF WORK WITH ALL SUB-CONTRACTORS TO ACHIEVE SMOOTH FLOW OF CONSTRUCTION.
15. SEAL AROUND ELECTRICAL RACEWAYS AT ALL WALLS, A/C ROOMS AND WALL LOUVER PENETRATIONS WITH FIREPROOF CAULKING. RE: SPECS. PROVIDE FLASHING AROUND PENETRATION, BOTH INSIDE AND OUTSIDE, TO PROVIDE FINISHED LOOK.
16. TIME OR MONEY ALLOWANCES WILL NOT BE MADE TO ACCOMMODATE UTILITY CONFLICTS THAT CAN BE REASONABLY RESOLVED BY COORDINATION DURING SHOP DRAWING PHASE.
17. 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.
18. MAINTAIN MANUFACTURER RECOMMENDED CLEARANCE AROUND ALL EQUIPMENT.
19. AFFIX ID TAGS TO ALL DIVISION 26 EQUIPMENT.
20. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH MECHANICAL AND PLUMBING CONTRACTOR REGARDING EQUIPMENT SIZES AND TYPES OF ELECTRICAL INTERFACE EQUIPMENT REQUIRED.
21. FIELD VERIFY ALL CONDITIONS AND MEASURE DIMENSIONS WITHIN THE BUILDING PRIOR TO ORDERING EQUIPMENT AND/OR PROCEEDING WITH INSTALLATION.
22. 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.
23. EQUIPMENT FOUND DEFECTIVE PRIOR TO FINAL ACCEPTANCE SHALL BE REPLACED AT NO COST TO OWNER.
24. WORK TO BE DONE UNDER ALLOWANCES BECOMES AN INTEGRAL PART OF THE PROJECT AND RESPONSIBILITY OF CONTRACTOR ONCE ALLOWANCE IS APPROVED.
25. SLEEVE ALL EXTERIOR WALL PENETRATIONS.
26. 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.
27. COMPACT TRENCH FILL TO 90% PROCTOR DENSITY IN 6" LIFTS.

KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING AEP PAD MOUNT TRANSFORMER.
2. PROVIDE UNDERGROUND SECONDARY LINE.
3. PROVIDE OVERHEAD FEEDER.

PLUMBING KEYED NOTES:

1. PROVIDE 4" SANITARY SEWER PIPING AND CONNECT INTO THE MAIN SEWER LINE AT THIS APPROXIMATE LOCATION. PROVIDE TWO WAY YARD CLEANOUT (NOT SHOWN FOR CLARITY).

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MERCEDES , TEXAS

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03.21.2025

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CODES & ORDINANCES:

1. GENERAL:
   a. UNLESS DRAWINGS OR SPECIFICATIONS HAVE MORE STRINGENT REQUIREMENTS, PERFORM ALL WORK PER APPLICABLE VERSION OF INTERNATIONAL BUILDING CODES, AND LOCAL CODES AND ORDINANCES.

   b. PRIOR TO SUBMITTING PROPOSAL, NOTIFY ENGINEER OF ANY ASPECTS OF DESIGN WHICH ARE THOUGHT TO BE IN NONCOMPLIANCE WITH APPLICABLE CODES.

2. PERMITS:
   a. CONTRACTOR IS RESPONSIBLE FOR ALL PERMITS AND FEES ASSOCIATED WITH PROJECT, INCLUDING FEES FOR INSPECTIONS, APPLICATIONS, AND PROVISION OF NEW SERVICES.

   b. CONTRACTOR WHO WILL ACTUALLY PERFORM WORK MUST APPLY FOR ALL REQUIRED PERMITS.

4. APPROVALS AND INSPECTIONS:
   a. OBTAIN APPROVAL FROM CITY FIRE DEPARTMENT AND BUILDING AND SAFETY DEPARTMENT PRIOR TO INSTALLATION OF ANY FIRE RELATED ITEMS.

   b. COORDINATE PRESSURE TESTS, INSPECTIONS, AND APPROVAL FOR ALL SYSTEMS WITH PERMITTING OFFICER, OWNER, AND ENGINEER.

GENERAL NOTES:

1. CONTRACT RELATED:
   a. 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.

   b. WORK TO BE DONE UNDER ALLOWANCES BECOMES AN INTEGRAL PART OF THE PROJECT AND RESPONSIBILITY OF CONTRACTOR ONCE ALLOWANCE IS APPROVED.

   c. 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.

2. TEST & BALANCE:
   a. TEST & BALANCE SHALL BE PERFORMED UNDER GENERAL CONTRACTOR, SEPARATE FROM MECHANICAL CONTRACT, DURING BIDDING, CONTRACTOR SHALL SUBMIT A COPY OF EVIDENCE THAT TAB AGENT MEETS THE QUALIFICATIONS SPECIFIED UNDER DIV. 23 SECTION 230593 TO PRIME CONTRACTOR.

   b. TEST & BALANCE TO COORDINATE MINIMUM AND MAXIMUM OUTSIDE AIR DAMPER SETTINGS WITH DDC CONTROLS AND ENGINEER. PROVIDE TIME ALLOTMENT FOR MULTIPLE DAMPER SETTINGS IN SOME CASES.

   c. CONTRACTOR SHALL COORDINATE TAB ACTIVITIES WITH TAB CONTRACTOR.

EQUIPMENT:

1. EQUIPMENT INSPECTION:
   a. FIELD VERIFY ALL CONDITIONS AND MEASURE DIMENSIONS WITHIN THE BUILDING PRIOR TO ORDERING EQUIPMENT AND/OR PROCEEDING WITH INSTALLATION.

   b. ALL EQUIPMENT SHALL BE FACTORY TESTED, AND CONTRACTOR SHALL VERIFY EQUIMENT CONDITION PRIOR TO INSTALLATION. CONTRACTOR IS RESPONSIBLE FOR EQUIPMENT DAMAGED DURING MOVING AND INSTALLATION.

   c. EQUIPMENT FOUND DEFECTIVE PRIOR TO FINAL ACCEPTANCE SHALL BE REPLACED AT NO COST TO OWNER.

2. EQUIPMENT ACCESS:
   a. PROVIDE MANUFACTURER RECOMMENDED AND CODE ENFORCED CLEARANCES AROUND EQUIPMENT. MAINTAIN 36" CLEAR IN FRONT OF VAV BOX CONTROLLER, ELECTRIC HEATERS, ETC.

   b. INSTALL ALL VALVES, CONTROLS, DAMPERS, FANS, ETC. IN ACCESSIBLE LOCATIONS. PROVIDE ADEQUATELY SIZED ACCESS DOORS WHERE REQUIRED.

3. EQUIPMENT INSTALLATION:
   a. PROVIDE SPRING HANGER TYPE VIBRATION ISOLATORS TO SUPPORT SUSPENDED AHUS, FANS AND OTHER POWERED VIBRATING EQUIPMENT. PROVIDE FLEXIBLE DUCT CONNECTORS.

   b. COMPLETELY WEATHERPROOF ALL EQUIPMENT, DUCTS, PIPES AND OTHER DEVICES AND MATERIALS INSTALLED OUTSIDE THE BUILDING, IN PARKING AREA, 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. PROVIDE ELECTRICAL HEAT TRACING FOR UTILITIES SUSCEPTIBLE TO FREEZING.

   c. AFFIX ID TAGS TO ALL MECHANICAL EQUIPMENT PER SPECIFICATIONS.

5. PLUMBING:
   a. PROVIDE CODE RECOMMENDED CLEARANCE OR MINIMUM 10" BETWEEN EXHAUST FANS DISCHARGES, PLUMBING VENTS AND AIR INTAKES. COORDINATE LOCATIONS WITH PLUMBING CONTRACTOR.

   b. PROVIDE INSULATED AND TRAPPED CONDENSATE DRAIN LINES FROM ALL AIR CONDITIONING EQUIPMENT AND TERMINATE TO NEAREST FLOOR DRAIN OR OTHER APPROVED RECEPTACLES. COORDINATE DRAINS WITH PLUMBING.

6. ELECTRICAL:
   a. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH ELECTRICAL CONTRACTOR REGARDING EQUIPMENT SIZES AND TYPES OF ELECTRICAL INTERFACE EQUIPMENT REQUIRED.

   b. DUE TO VARIATIONS IN EQUIPMENT CHARACTERISTICS BY DIFFERENT EQUIPMENT SUPPLIERS, MECHANICAL EQUIPMENT ULTIMATELY PROVIDED MAY DIFFER IN HORSEPOWER OR AMPERAGE REQUIREMENTS FROM THAT SPECIFIED IN THESE DRAWINGS. COORDINATE WITH GENERAL CONTRACTOR PRIOR TO BIDDING, AND PRIOR TO SUBMITTALS AND ORDERING EQUIPMENT, TO ENSURE THAT EQUIPMENT ELECTRICAL REQUIREMENTS ARE CONVEYED TO ELECTRICAL CONTRACTOR. IT IS SOLELY CONTRACTOR'S RESPONSIBILITY TO ENSURE COMPATIBILITY ISSUES ARE COORDINATED.

INSULATION:

1. FIBERGLASS INSULATION MAY NOT BE USED ON ANY COLD PIPING SURFACES; ONLY CLOSED CELL INSULATION IS ACCEPTABLE.

2. PROVIDE INSULATION ON ALL SURFACES CAPABLE OF CREATING CONDENSATION.

DUCTWORK:

1. DUCTWORK GENERAL:
   a. DRAWINGS ARE DIAGRAMMATIC IN NATURE. FOR CLARITY SAKE, MOST DUCT OFFSETS/RISES/DROPS ARE NOT SHOWN. WHERE DUCTS PENETRATE WALLS, INSTALL THEM PERPENDICULAR TO WALL.

   b. RECTANGULAR AND ROUND DUCTWORK SHALL BE GALVANIZED STEEL. SIZES SHOWN ARE INSIDE CLEAR DIMENSION, UNLESS NOTED OTHERWISE.

   c. VERIFY BOTTOM OF DUCT ELEVATION AND COORDINATE WITH OTHER TRADES.

   d. CONSTRUCT AND LEAKAGE TEST ALL DUCTWORK BASED ON SPECIFICATIONS AND SMACNA REQUIREMENTS, WHICHEVER IS MORE STRINGENT. COORDINATE PRESSURE CLASSES WITH EQUIPMENT SCHEDULES.

   e. FLEXIBLE DUCTS MAXIMUM LENGTH SHALL NOT EXCEED 6 FEET. USE OF FLEXIBLE DUCTWORK IS LIMITED TO AREAS WITH AN ACCESSIBLE SUSPENDED CEILING. PINCHED DUCT WILL HAVE TO BE REPLACED.

   f. IN AREAS WHERE DUCT CONFLICTS CANNOT BE AVOIDED, ROUTE SMALLER DUCTS THROUGH ROO JOISTS.

   g. LOCATE AIR DEVICES AS SHOWN. COORDINATE WITH ELECTRICAL, IF NEEDED. RELOCATE DIFFUSER TO ADJACENT TILE.

2. DUCTWORK INSULATION:
   a. WRAP ALL OUTSIDE AIR, SUPPLY AND RETURN DUCTWORK UNLESS NOTED OTHERWISE.

   b. IN ADDITION, FOR ACOUSTICAL PERFORMANCE INTERNALLY LINE FIRST 10' OF SUPPLY AND LAST 10' OF RETURN DUCTWORK.

   c. PROVIDE ACOUSTICAL LINING FOR ALL TRANSFER DUCTS AND RETURN AIR ELBOWS.

   d. INSULATION ON DUCT SHOULD TO BE PROPERLY TAPED AND MASTICS MUST BE APPLIED ON SEAMS AND JOINTS AND AT ENDS ADJACENT TO DUCT FLANGES AND FITTINGS. FOR DUCT SIDES WITH DIMENSIONS LARGER THAN 18 INCHES, APPLY ADDITIONAL PINS AND CLIPS TO HOLD INSULATION TIGHTLY AGAINST SURFACE AT CROSS BRACING.

   e. INSULATE ALL EXHAUST DUCTWORK 10 FEET FROM EXTERIOR OPENING.

3. DUCT FITTINGS:
   a. WHERE RECTANGULAR TEE FITTINGS ARE SHOWN, PROVIDE FITTING WITH ADJUSTABLE DIVIDER SHEET AND TURNING VANES.

   b. WHERE RECTANGULAR MAIN AND BRANCH CONNECTIONS ARE SHOWN, PROVIDE EXTRACTOR VANES. NOT APPLICABLE TO DUCTWORK DOWNSTREAM OF VAV BOXES.

   c. PROVIDE TURNING VANES IN ALL ELBOWS PER SPECS.

4. DAMPERS:
   a. IN AN ACCESSIBLE LOCATION, PROVIDE MANUAL-TYPE VOLUME BALANCING DUCT DAMPERS IN ALL SUPPLY, RETURN AND EXHAUST DUCT BRANCHES TO INDIVIDUAL GRILLES, REGISTERS AND DIFFUSERS (GRD). TO MINIMAZE NOISE INSTALL DAMPERS CLOSSER TO THE BRANCH CONNECTION THAN TO THE GRD. IN DUCTWORK, PROVIDE ACCESS DOORS TO ALL DAMPERS.

   b. ABOVE INACCESSIBLE CEILINGS AND IN CASE DUCT CONFIGURATION DOES NOT ALLOW FOR INSTALLATION OF DAMPER IN DUCTWORK, PROVIDE REMOTE MANUAL DAMPER BY YOUNG REGULATOR OR EQUAL, (CABLE OPERATED SYSTEM) WITH ENGINEER'S PERMISSION CONTRACTOR MAY PROVIDE VOLUME DAMPER THAT IS INTEGRAL TO GRD.

   c. PROVIDE BALANCING DAMPERS ON ALL EXHAUST GRILLES TO ACHIEVE DESIRED AIRFLOW.

   d. PROVIDE DYNAMIC FIRE DAMPERS (RUSKIN DIDR20, TYPE B OR EQUAL) IN ACCORDANCE WITH CODE REQUIREMENT, IN ALL PENETRATIONS OF FIRE RATED WALLS, OCCUPANCY SEPARATION WALLS, BARRIERS AND PARTITIONS, AND EXIT CORRIDORS. REFER TO ARCHITECTURAL PLANS FOR RATED WALLS. PROVIDE ACCESS DOORS AS PER CODE REQUIREMENTS, EQUAL TO RUSKIN ADH-22 FOR RECTANGULAR DUCT, ACUDOR RD FOR ROUND DUCT. WHERE GRILLE ACCESS IS INDICATED, ADDITIONAL DUCT ACCESS DOOR IS NOT REQUIRED. WHERE THE CEILING IS FIRE RATED PROVIDE FIRE RATED AIR DEVICES FOR TRANSFER & RETURN AIR GRILLES AND SUPPLY AIR DIFFUSERS AS PER CODE REQUIRMENTS. REFER TO ARCHITECTURAL PLANS FOR RATED CEILINGS.

   e. PROVIDE ACCESS DOORS (NOT SHOWN IN DRAWINGS) FOR INSPECTION OF DUCT MOUNTED EQUIPMENT SUCH AS FIRE/SMOKE DAMPERS, MANUAL BALANCING DAMPERS AND TURNING VANES. IN AREAS WITH HARD CEILING COORDINATE ACCESS DOOR LOCATIONS AND CEILING ACCESS PANELS WITH OTHER TRADES.

COORDINATION:

1. GENERAL:
   a. CONTRACTOR SHALL REVIEW COMPLETE DOCUMENTS PRIOR TO SUBMITTAL OF PROPOSAL TO GAIN COMPLETE UNDERSTANDING OF PROJECT SCOPE, WORK BY OTHERS, AND MECHANICAL WORK ASSOCIATED WITH OTHER DISCIPLINES.

   b. 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. COORDINATE MECHANICAL WITH OTHER TRADES SUCH AS PLUMBING, ELECTRICAL AND STRUCTURAL WORK. COORDINATE SCHEDULE OF WORK WITH ALL SUB-CONTRACTORS TO ACHIEVE SMOOTH FLOW OF CONSTRUCTION.

   c. TIME OR MONEY ALLOWANCES WILL NOT BE MADE TO ACCOMMODATE UTILITY CONFLICTS THAT CAN BE REASONABLY RESOLVED BY COORDINATION DURING SHOP DRAWING STAGE.

   d. PROVIDE COORDINATION DRAWINGS OF REFLECTED CEILING PLAN AND SECTION ABOVE CEILING SHOWING WORK OF ALL AFFECTED TRADES. DO NOT PROCEED WITH FABRICATION WORK UNTIL COORDINATION DRAWINGS HAVE BEEN APPROVED BY A/E.

   e. 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.

2. SITE:
   a. TIME OR MONEY ALLOWANCES WILL NOT BE MADE TO ACCOMMODATE UTILITY CONFLICTS THAT CAN BE REASONABLY RESOLVED BY COORDINATION DURING SHOP DRAWING STAGE.

3. ARCHITECTURAL:
   a. REFER TO ARCHITECTURAL PLANS FOR DETAILS OF CONSTRUCTION, INCLUDING BEAMS, FLOOR AND WALL PENETRATIONS, CHASES, AND REFLECTED CEILING PLANS. VERIFY OPENING SIZES WITH EQUIPMENT FURNISHED.

   b. SLEEVE ALL EXTERIOR WALL AND GRADE BEAM PENETRATIONS. GRADE BEAM PENETRATIONS SHALL BE MADE WITHIN MIDDLE 1/3 OF VERTICAL SPAN OF BEAM.

   c. SEAL AROUND DUCTS AND PIPING AT ALL WALLS, A/C ROOMS AND WALL LOUVER PENETRATIONS WITH FIREPROOF CAULKING. RE: SPECS. PROVIDE ESCUTCHEON PLATES AND FLASHING AROUND PENETRATION, BOTH INSIDE AND OUTSIDE, TO PROVIDE FINISHED LOOK.

4. SPATIAL COORDINATION:
   a. COORDINATE ALL WORK WITH OTHER TRADES; COORDINATE SCHEDULE OF WORK WITH ALL SUB-CONTRACTORS TO ACHIEVE SMOOTH FLOW OF CONSTRUCTION.

   b. SPACES ABOVE CEILING ARE CONGESTED. DESIGN INTENT IS THAT UTILITIES BE INSTALLED TIGHT AGAINST CEILING STRUCTURE TO EXTENT POSSIBLE, WHILE RETAINING ADEQUATE MAINTENANCE ACCESS PER CODES.

   c. IN CASE OF CONFLICTS, ITEMS SHALL BE ARRANGED ACCORDING TO THE FOLLOWING PRIORITIES: LIGHTING, FIRE PROTECTION, HVAC. PROVIDE OFFSETS/RISES/DROPS REQUIRED TO RESOLVE CONFLICTS WITH OTHER UTILITIES, AND TO ACCOMMODATE ALL UTILITIES ABOVE CEILINGS.

   d. IN GENERAL, REROUTE SMALLER DUCTS/PIPES THROUGH JOISTS TO RESOLVE CONFLICTS WITH LARGER. PERFORM REROUTING IN MOST EFFICIENT MANNER POSSIBLE, AND IN ACCORDANCE WITH INDUSTRY STANDARDS.

   e. PROVIDE COORDINATION DRAWINGS OF REFLECTED CEILING PLAN AND SECTION ABOVE CEILING SHOWING WORK OF ALL AFFECTED TRADES. DO NOT PROCEED WITH FABRICATION WORK UNTIL COORDINATION DRAWINGS HAVE BEEN APPROVED BY A/E.

   f. IN GENERAL ROUTE DUCTS/PIPES IN MOST EFFICIENT MANNER POSSIBLE, AND IN ACCORDANCE WITH INDUSTRY STANDARDS.

   g. SEE ELECTRICAL PLANS FOR EXACT LOCATION OF ELECTRICAL PANELS TO AVOID DUCTWORK AND PIPING RUNNING OVER THESE AREAS. COORDINATE WITH ELECTRICAL CONTRACTOR.

   h. LOCATE AIR DEVICES AS SHOWN. COORDINATE WITH OTHER TRADES TO AVOID CONFLICT AND ADJUST LOCATION IF NEEDED WITHOUT COMPROMISING AIR DEVICES PERFORMANCE.

5. CONTROLS:
   a. REFER TO SPECIFICATIONS FOR CONTROL COMPONENTS AND DEVICES TO BE COORDINATED WITH MECHANICAL WORK.

   b. CONTRACTOR IS RESPONSIBLE FOR INSTALLING LOW VOLTAGE POWER AND COMMUNICATIONS. REFERENCE SPECIFICATIONS FOR CONTROL WORK.

   c. DRAWINGS SHOW GENERAL LOCATION OF SENSORS (T, RH). UNLESS NOTED OTHERWISE, INSTALL SENSORS AT 48" ABOVE FINISHED FLOOR. WIRING SHALL BE IN CONCEALED WALLS. IN CASE OF CONFLICTS WITH FURNITURE, WINDOWS, ETC., COORDINATE EXACT LOCATION WITH ARCHITECT AND ENGINEER.

ABBREVIATIONS

A	AMPS	HP	HORSEPOWER
ACCU	AIR COOLED CONDENSING UNIT	HS	HUMIDITY SENSOR
ACT	ACTUATOR	HVAC	HEATING, VENTILATION, & AIR CONDITIONING
AFF	ABOVE FINISHED FLOOR	LVG.	LEAVING
AHU	AIR HANDLING UNIT	MECH	MECHANICAL
B.	BOTTOM	MOT. STRTR.	MOTOR STARTER
BAS	BUILDING AUTOMATION SYSTEM	MS	MOTOR STARTER
BOP	BOTTOM OF PIPE	MZ	MULTI-ZONE
BOTT.	BOTTOM	NC	NORMALLY CLOSED
C.	CONDUIT OR COMMON	NO	NORMALLY OPEN
CLG.	CEILING OR COOLING	NTS	NOT TO SCALE
COMB.	COMBINATION	OA	OUTSIDE AIR
CONC.	CONCRETE	PH	PHASE
COND.	CONDUIT	RA	RETURN AIR
CU.	COPPER	RAG/RG	RETURN AIR GRILLE
CW	CITY WATER	RD	ROOF DRAIN
DDC	DIRECT DIGITAL CONTROLS	RM.	ROOM
DMPR.	DAMPER	RPZ	REDUCED PRESSURE ZONE
DISC.	DISCONNECT	SA	SUPPLY AIR
EAG/EG	EXHAUST AIR GRILLE	SD	SUPPLY AIR DIFFUSER
EMS	ENERGY MANAGEMENT SYSTEM	SS	STAINLESS STEEL
ENT.	ENTERING	SZ	SINGLE ZONE
EXT.	EXTERNAL OR EXTERIOR	TAB	TESTING & BALANCING
FCU	FAN COIL UNIT	T.O.L.	TOP OF LOUVER
FD	FIRE DAMPER	TS	TEMPERATURE SENSOR
FPI	FINS PER INCH	TSTAT	THERMOSTAT
G.	GROUND	UG	UNDERGROUND
GA.	GAGE	UNO	UNLESS OTHERWISE NOTED
GALV.	GALVANIZED	V	VOLTS
GPM	GALLONS PER MINUTE	VAV	VARIABLE AIR VOLUME
GRND.	GROUND	VFD	VARIABLE FREQUENCY DRIVE
HB	HOSE BIBB	W	WIRE

MECHANICAL SYMBOLS LEGEND

12x12	DUCT SIZE: FIRST FIGURE IS SIDE SHOWN
(12x12)	BELOW DUCT SIZE: FIRST FIGURE IS SIDE SHOWN
	DIRECTION OF FLOW-RETURN
	DIRECTION OF FLOW-SUPPLY
	FLEXIBLE DUCT
EG-X cfm	EXHAUST AIR GRILLE
RG/TG-X cfm	RETURN AIR/TRANSFER AIR GRILLE
SD-X cfm	SUPPLY AIR DIFFUSER
	BACKDRAFT DAMPER
AFR	AUTO-FLOW REGULATOR
	DRAIN VALVE
	BALL VALVE
T	THERMOSTAT
RH	SPACE HUMIDITY SENSOR
RH	DUCT HUMIDITY SENSOR
C	SPACE CARBON DIOXIDE SENSOR
SP	STATIC PRESSURE SENSOR
C	DUCT CARBON DIOXIDE SENSOR

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MERCEDES, TEXAS



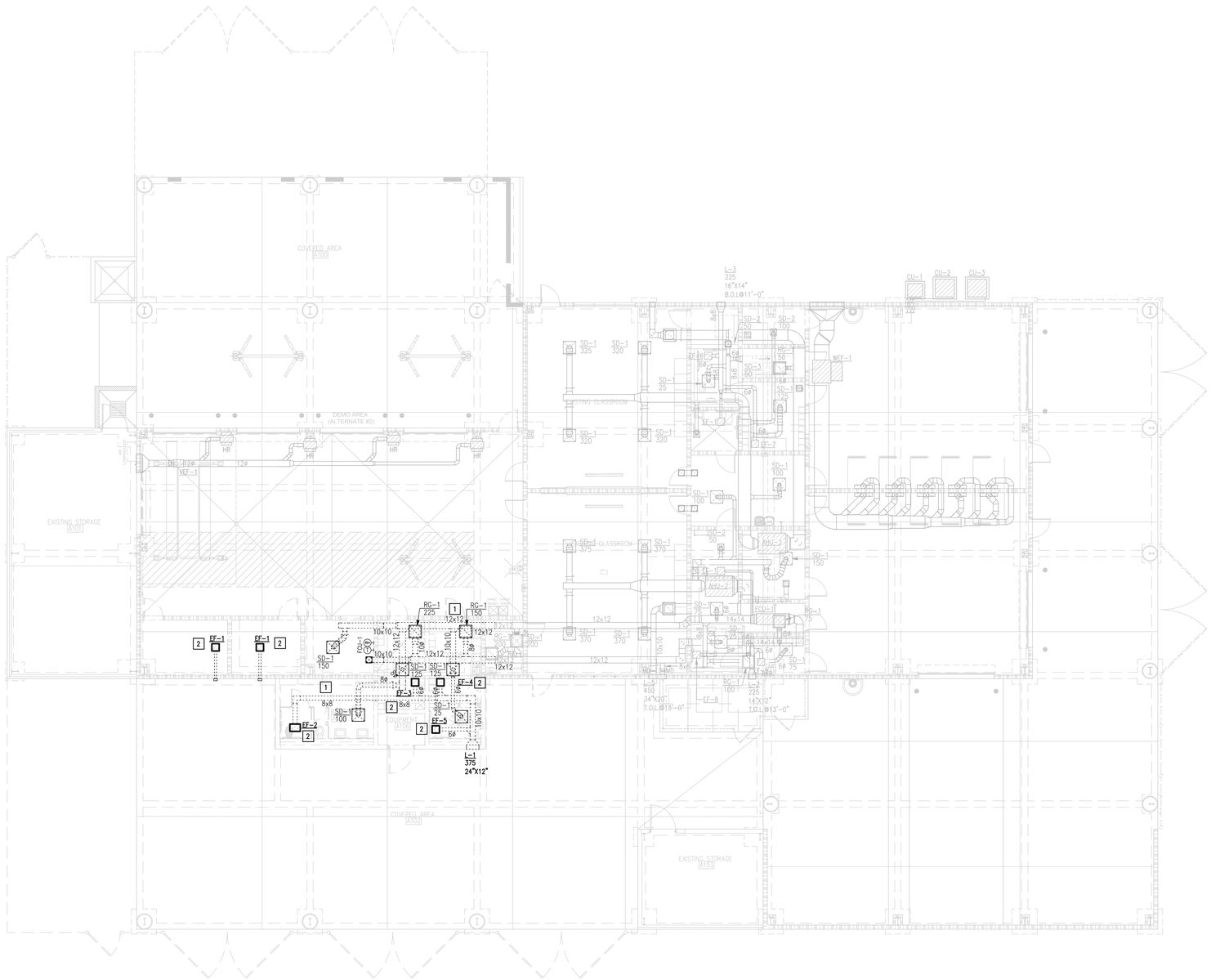
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Project Architect: David Monreal, AIA
Drawn By: B.B.
Job No. 25v22
Sheet:

M1.01

MECHANICAL
DEMOLITION KEYED NOTES:

1. DEMOLISH EXISTING DUCTWORK AND AIR DEVICES AS SHOWN.
2. DEMOLISH EXISTING EXHAUST FANS AND CONTROLS AS SHOWN.
3. RETAIN AND REUSE THERMOSTAT AND RH SENSORS. REFER TO MECHANICAL RENOVATION PLAN FOR NEW SENSOR LOCATIONS.



01 MECHANICAL DEMOLITION FLOOR PLAN
SCALE : 1/8" = 1'-0"

PLAN NORTH

LEGEND	
	EXISTING EQUIPMENT TO REMAIN
	EXISTING EQUIPMENT TO BE DEMOLISHED
6x6	EXISTING DUCTWORK TO REMAIN
6x6	EXISTING DUCTWORK TO BE DEMOLISHED
	EXISTING AIR DEVICE TO REMAIN
	EXISTING AIR DEVICE TO BE DEMOLISHED
T RH	EXISTING T-STAT, AND RH SENSORS TO BE RELOCATED

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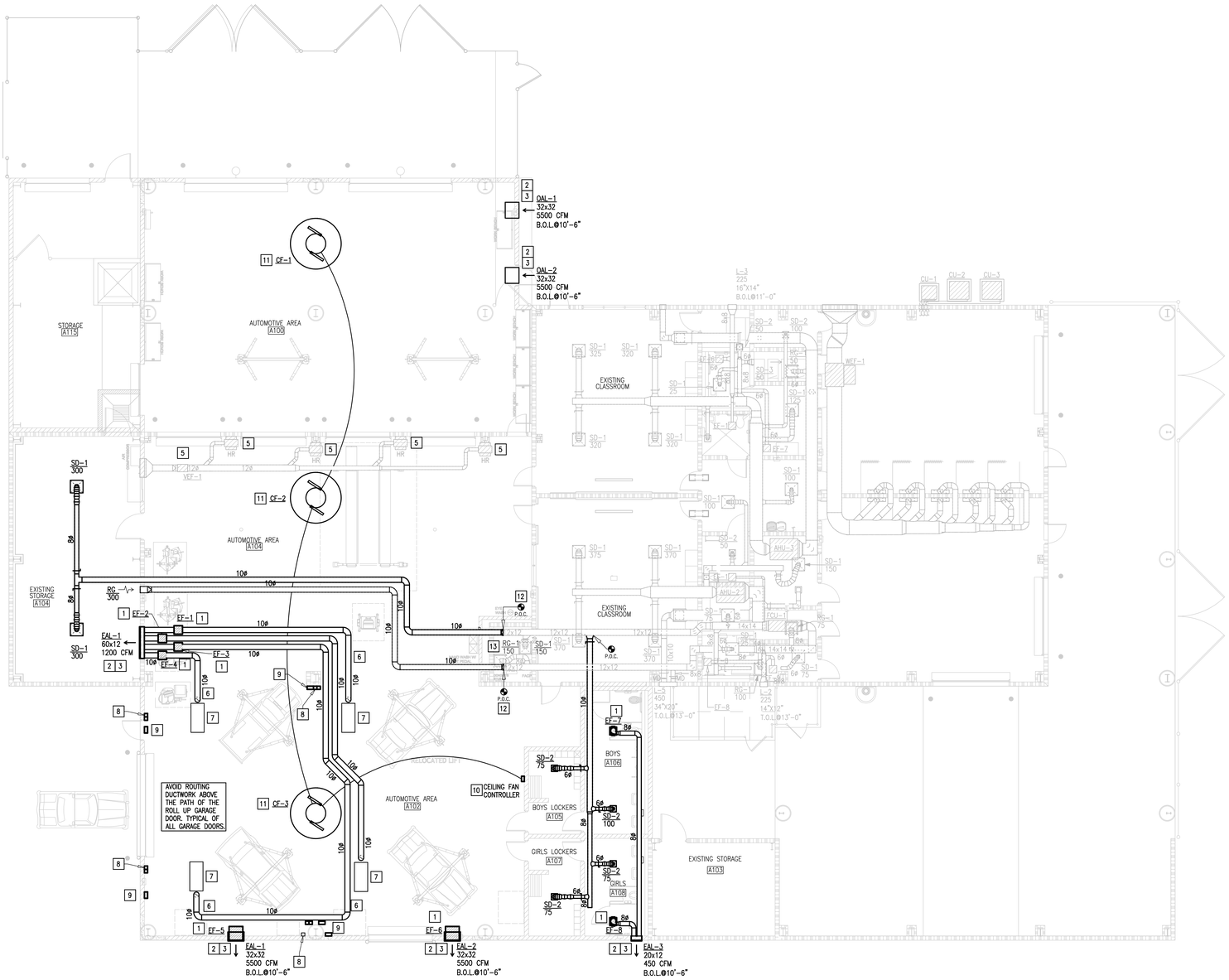
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CESAR A. GONZALEZ
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01 MECHANICAL RENOVATION FLOOR PLAN

SCALE : 1/8" = 1'-0"

PLAN NORTH

MECHANICAL KEYED NOTES:

1. PROVIDE EXHAUST FAN AS SCHEDULED. SEE ASSOCIATED DETAIL ON DETAIL SHEET.
2. PROVIDE LOUVER AS SCHEDULED. COORDINATE FINAL FINISH, SIZE AND LOCATION WITH ARCHITECT PRIOR TO ORDERING.
3. SLEEVE ALL WALL PENETRATIONS PER SPECIFICATIONS. SEAL AROUND DUCTS & PIPING AT ALL WALLS, AC ROOMS AND WALL LOUVER PENETRATIONS WITH FIRE-PROOF CAULKING. PROVIDE ESCUTCHEON PLATES AND FLASHING AROUND PENETRATION, BOTH INSIDE AND OUTSIDE TO PROVIDE A FINISH LOOK. (TYPICAL)
4. CODE AND WORKING CLEARANCE FOR ELECTRICAL PANELS. DO NOT ROUTE DUCT OR PIPING DIRECTLY ABOVE ELECTRICAL EQUIPMENT FOOTPRINT. SEE ELECTRICAL PLANS FOR EXACT LOCATION. (TYPICAL)
5. EXISTING VEHICLE EXHAUST SYSTEM TO BE RETAINED AND REPAIRED BY OWNER.
6. HIGH STATIC PRESSURE SPIRAL PIPE DUCTWORK WITH WELDED JOINTS. INSTALL DUCTWORK AS HIGH AS POSSIBLE TO AVOID OVERHEAD DOOR RAIL ASSEMBLY. COORDINATE WITH GENERAL CONTRACTOR.
7. PROVIDE SOURCE CAPTURE EXHAUST SYSTEM AS PER DETAIL. REFER TO DETAILS SHEET. INSTALL HOSE REEL PER MANUFACTURER'S RECOMMENDATIONS USING STEEL BASE, UNISTRUTS, LATERAL BRACING, AND VIBRATION ISOLATORS. SEE DETAIL ON DETAILS SHEET.
8. SWITCH FOR SOURCE CAPTURE EXHAUST FAN BY DIVISION 26. COORDINATE WITH ELECTRICAL CONTRACTOR (TYPICAL).
9. PROVIDE WALL MOUNTED CARBON MONOXIDE SENSORS AND MONITORING SYSTEM WITH AUDIBLE ALARM CAPABILITY. VERIS INDUSTRIES G SERIES SENSOR AND GMXA MONITOR, OR EQUAL. COORDINATE POWER REQUIREMENTS AND STEP DOWN TRANSFORMER WITH ELECTRICAL.
10. PROVIDE FAN CENTRAL CONTROLLER WITH A HINGED WIRE GUARD. VERIFY FAN CONTROLLER DIMENSIONS PRIOR TO PROVIDING WIRE GUARD. CONTROLLER TO BE FURNISHED BY DIV. 23 AND INSTALLED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
11. PROVIDE CEILING FANS AS SCHEDULED WITH DIGITAL KEYPAD.
12. CONNECT NEW DUCTWORK INTO EXISTING AT THIS APPROXIMATE LOCATION.
13. PERFORM TAB ACTIVITIES TO EXISTING AIR DEVICE AND BALANCE TO CFM AS SHOWN.
14. RELOCATE EXISTING THERMOSTAT AND RH SENSORS WHERE INDICATED. INSTALL 48" A.F.F. COORDINATE WITH ARCHITECT AND OWNER TO MEET ADA REQUIREMENTS. PROVIDE CLEAR LOCKING COVER FOR ALL SENSORS.

LEGEND	
	EXISTING EQUIPMENT TO REMAIN
	NEW EQUIPMENT TO BE INSTALLED
6x6	EXISTING DUCTWORK TO REMAIN
6x6	NEW DUCTWORK TO BE INSTALLED
	EXISTING AIR DEVICE TO REMAIN
	NEW AIR DEVICE TO BE INSTALLED
T RH	EXISTING T-STAT, AND RH SENSORS TO BE RELOCATED

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EXHAUST FAN SCHEDULE

MARK	SERVING	ELECTR. V/PH	MOUNT	CFM	INPUT WATTS	MOTOR HP	RPM	E.S.P. IN. WG	SOUND IN SONES	WEIGHT (LBS)	MCA	MOCP	MANUFACTURER	MODEL NUMBER	CONTROL NOTES	NOTES
EF-1	AUTO SHOP	115/1/60	IN-LINE	300	99	-	1198	0.4	3.5	25	1.8	15	GREENHECK	CSP-A390	A	1-4
EF-2	AUTO SHOP	115/1/60	IN-LINE	300	99	-	1198	0.4	3.5	25	1.8	15	GREENHECK	CSP-A390	A	1-4
EF-3	AUTO SHOP	115/1/60	IN-LINE	300	99	-	1198	0.4	3.5	25	1.8	15	GREENHECK	CSP-A390	A	1-4
EF-4	AUTO SHOP	115/1/60	IN-LINE	300	99	-	1198	0.4	3.5	25	1.8	15	GREENHECK	CSP-A390	A	1-4
EF-5	AUTO SHOP	208/1/60	WALL	5500	-	1	825	0.3	13.2	80	11	15	GREENHECK	SBE-2L24	A	1-4
EF-6	AUTO SHOP	208/1/60	WALL	5500	-	1	825	0.3	13.2	80	11	15	GREENHECK	SBE-2L24	A	1-4
EF-7	BOYS	115/1/60	CEILING	300	121	-	-	0.4	3.0	31	-	-	GREENHECK	SP-A410	B	2-6
EF-8	GIRLS	115/1/60	CEILING	150	128	-	-	0.313	3.0	11	-	-	GREENHECK	SP-B150	B	2-6

NOTES:

1. PROVIDE WITH BELT TENSIONER, OSHA WIRE GUARD, WALL COLLAR.
2. MANUFACTURER AND MODEL NUMBER LISTED ARE "OR APPROVED EQUAL." REFER TO SPECIFICATIONS.
3. PROVIDE FAN WITH ALL ALUMINUM BACKDRAFT DAMPER.
4. PROVIDE FACTORY MOUNTED DISCONNECT.
5. PROVIDE FIELD-INSTALLED FAN SPEED CONTROLLER. COORDINATE INSTALLATION WITH ELECTRICAL CONTRACTOR.
6. PROVIDE RUBBER BUSHING VIBRATION ISOLATORS FOR CEILING MOUNTED TYPE FANS.

CONTROL NOTES:

A. FAN SHALL BE OPERATED BY WALL SWITCH. PROVIDED BY DIV 26. COORDINATE WITH ELECTRICAL CONTRACTOR.
B. FAN SHALL BE OPERATED BY A WALL SWITCH VIA THE OCCUPANCY SENSOR PROVIDED BY DIV.26 COORDINATE WITH ELECTRICAL.

CEILING FANS SCHEDULE

MARK	SIZE FT	COVERAGE AREA	NO. OF AIRFOILS	MAX RPM	MAX POWER AMPS	MOTOR HP	ELECTRICAL V/P/F	WEIGHT LBS	NOTES	MANUFACTURER & MODEL NUMBER
CF-1 THRU CF-3	8	4,150 SQ.FT.	3	178	1.4	3/4	208/1/60	102	ALL	MACROAIR AVD3

NOTES:

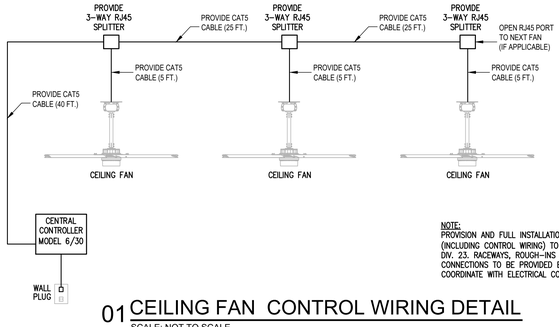
1. MANUFACTURER AND MODEL NUMBER LISTED ARE "OR APPROVED EQUAL".
2. PROVIDE WITH BRUSHLESS, PERMANENT MAGNET, TRANSVERSE FLUX DX MOTOR.
3. PROVIDE WALL MOUNTED CENTRAL CONTROLLER MODEL 6/30. ALL FANS SHALL BE CONTROLLED FROM SINGLE CONTROLLER. CONTROLLER SHALL HAVE PROGRAMABLE SCHEDULE CAPABILITIES FOR EACH FAN.
4. BLADES SHALL BE ANODIZED ALUMINUM.
5. PROVIDE GEARLESS DIRECT DRIVE FAN / MOTOR ASSEMBLY. NO GEARBOX.
6. PROVIDE "UNIVERSAL MOUNT" HARDWARE WITH UNISTRUT SPAN MOUNTING IN BETWEEN Z-PURLINS AND GUY WIRES AS PER MANUFACTURER'S RECOMMENDATIONS.
7. FAN MUST BE WASH DOWN DUTY RATED.
8. FAN MUST BE NFPA COMPLIANT.
9. PROVIDE LOCAL (TEXAS) FACTORY AUTHORIZED STARTUP SERVICES.
10. PROVIDE 50,000 HOUR WARRANTY ON FAN / MOTOR/ DIGITAL KEYPAD & 3 YEAR LABOR WARRANTY.
11. MANUFACTURER TO PROVIDE PERFORMANCE DATA WITH SUBMITTAL.

LOUVER SCHEDULE

MARK	SERVES	CFM RANGE	FACE SIZE (W X H)	MIN. FREE AREA (FT2)	MANUFACTURER	MODEL NUMBER	NOTES
SUPPLY							
OAL-1	OPEN AREA	5500	32 X 32	3.00	RUSKIN	EME520MD	ALL
OAL-2	OPEN AREA	5500	32 X 32	3.00	RUSKIN	EME520MD	ALL
EXHAUST							
EAL-1	EF-1, 2, 3, 4	1200	60 X 12	1.66	RUSKIN	EME520MD	1-4
EAL-2	EF-5	5500	32 X 32	3.00	RUSKIN	EME520MD	ALL
EAL-3	EF-6	5500	32 X 32	3.00	RUSKIN	EME520MD	ALL
EAL-4	EF-7, 8	450	20 X 12	0.51	RUSKIN	EME520MD	1-4

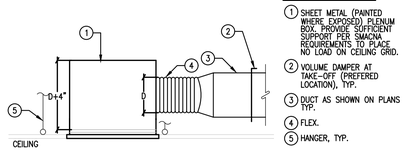
NOTES:

1. PRIOR TO ORDERING, COORDINATE LOUVER FINISH AND EXACT FACE SIZE WITH ARCHITECT.
2. PROVIDE STAINLESS STEEL BIRD SCREEN AND HARDWARE.
3. PROVIDE FACTORY APPLIED KYNAR 500 FINISH.
4. PROVIDE WITH TDI PRODUCT EVALUATION REPORT.
5. PROVIDE WITH GSS WALL SHUTTER AND TOGGLE SWITCH.



NOTE:
PROVISION AND FULL INSTALLATION OF CEILING FANS (INCLUDING CONTROL WIRING) TO BE PROVIDED BY DIV. 23. RACEWAYS, ROUGH-INS AND ELECTRICAL CONNECTIONS TO BE PROVIDED BY DIV. 26. COORDINATE WITH ELECTRICAL CONTRACTOR.

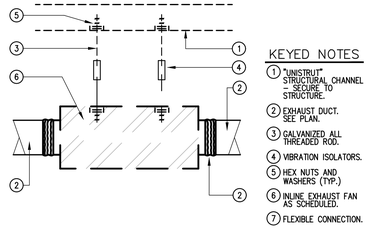
01 CEILING FAN CONTROL WIRING DETAIL
SCALE: NOT TO SCALE



KEYED NOTES:

1. SHEET METAL (PAINTED WHERE EXPOSED) PLENUM BOX. PROVIDE SUFFICIENT SUPPORT PER SMACNA REQUIREMENTS TO PLACE NO LOAD ON CEILING GRID.
2. VOLUME DAMPER AT TAKE-OFF (PREFERED LOCATION), TYP.
3. DUCT AS SHOWN ON PLANS TYP.
4. FLEX.
5. HANGER, TYP.

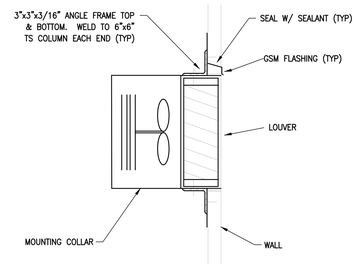
02 CEILNG RETURN GRILLE DETAIL
SCALE: NOT TO SCALE



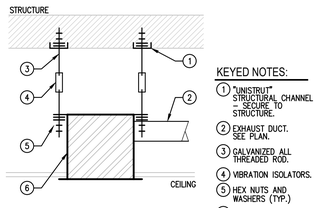
KEYED NOTES

1. "UNISTRUT" STRUCTURAL CHANNEL – SECURE TO STRUCTURE.
2. EXHAUST DUCT. SEE PLAN.
3. GALVANIZED ALL THREADED ROD.
4. VIBRATION ISOLATORS.
5. HEX NUTS AND WASHERS (TYP.)
6. INLINE EXHAUST FAN AS SCHEDULED.
7. FLEXIBLE CONNECTION.

03 INLINE EXHAUST FAN DETAIL
SCALE : NOT TO SCALE



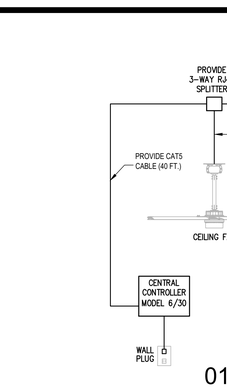
04 PROPELLER EXHAUST FANS
SCALE : NOT TO SCALE



KEYED NOTES:

1. "UNISTRUT" STRUCTURAL CHANNEL – SECURE TO STRUCTURE.
2. EXHAUST DUCT. SEE PLAN.
3. GALVANIZED ALL THREADED ROD.
4. VIBRATION ISOLATORS.
5. HEX NUTS AND WASHERS (TYP.)
6. CEILING EXHAUST FAN AS SCHEDULED.

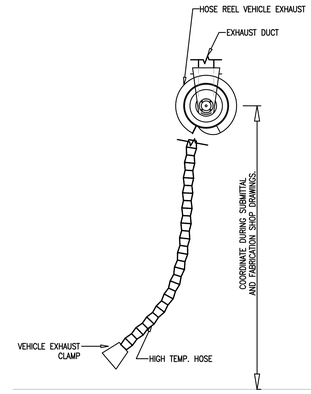
CEILING EXHAUST FAN
05 FAN MOUNTING DETAIL
SCALE : NOT TO SCALE



KEYED NOTES

1. 1/2" MAXIMUM HANGER RODS (SUPPLIED IN FIELD).
2. NEOPRENE WASHER

SPRING ISOLATION
06 HANGER DETAIL
SCALE : NOT TO SCALE



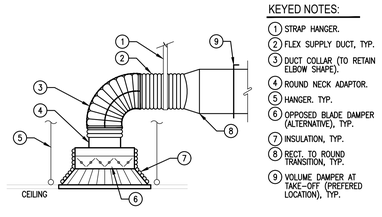
VEHICLE EXHAUST NOTES:

(MANUFACTURER IS MONOXVENT)

A. PROVIDE A SOURCE CAPTURE SYSTEM WITH THE FOLLOWING ACCESSORIES. PROVIDE REQUIRED MOUNTING SUPPORT FRAMES, SUPPORT BRACES, AND ALL OTHER MOUNTING HARDWARE.

- SPRING HOSE REEL: WIDENED WITH 30' X 4" SERIES 4000 HOSE. PRIOR TO SUBMITTALS, COORDINATE EXACT LENGTH WITH OWNER AND ENGINEER.
- ADAPTER, RUBBER OVAL MOUTH WITH SPRING CLAMP FOR 4" DIAMETER HOSE, WITH SLEEVE.
- (1) 23670 Y-FITTING, (2) 5.5' X 4" SERIES 3000 HOSES, (2) 23827 ADAPTERS.
- WORM GEAR CLAMP FOR 4" DIAMETER HOSE.
- CONTROL BOX STARTER FOR FAN ACTIVATION.

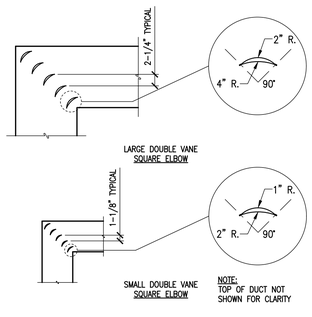
07 SOURCE CAPTURE SYSTEM ELEVATION DETAIL
SCALE : N.T.S.



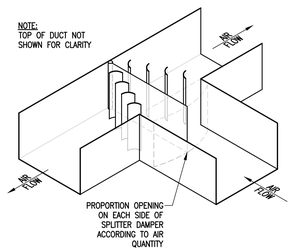
KEYED NOTES:

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.

08 CEILING DIFFUSER SUPPORT DETAIL
SCALE : NOT TO SCALE



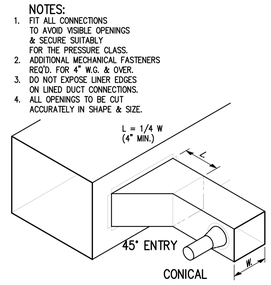
TYPICAL VANED DUCT
09 ELBOWS DETAIL
SCALE : NOT TO SCALE



10 TYPICAL SPLITTER DAMPER DETAIL
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.



BRANCH
11 CONNECTION DETAIL
SCALE : NOT TO SCALE

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SOUTH TEXAS I.S.D. - MERCEDES VOCATIONAL BUILDING RENOVATIONS

MERCEDES, TEXAS

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03.21.2025

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Scale:	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	B.B.
Job No.	22y22
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ABBREVIATIONS:

A	AMPS	EF	EXHAUST FAN	INT.	INTRUSION DETECTION	W	WIRE
ABC	ABOVE CEILING LINE	EX	EXISTING	NTS	NOT TO SCALE	V	VOLTS
AC	ABOVE COUNTER BACKSPLASH	EXT.	EXTERNAL OR EXTERIOR	MCA	MINIMUM CIRCUIT AMPACITY		
ACCU	AIR COOLED CONDENSING UNIT	FACP	FIRE ALARM CONTROL PANEL	MECH	MECHANICAL		
AFF	ABOVE FINISHED FLOOR	FCU	FAN COIL UNIT	MOCP	MAXIMUM OVER CURRENT PROTECTION		
B.	BOTTOM	FLA	FULL LOAD AMPS				
BLC.	BELOW CEILING LINE	FS	FLAT SCREEN	MS	MOTOR STARTER		
C.	CONDUIT OR COMMON	G.	GROUND	PH	PHASE		
CLG.	CEILING	GA.	GAGE	RM.	ROOM		
COMB.	COMBINATION	GALV.	GALVANIZED	SPD	SURGE PROTECTION DEVICE		
COND.	CONDUIT	GRND.	GROUND	SS	STAINLESS STEEL		
CU.	COPPER	HP	HORSEPOWER	TSTAT	THERMOSTAT		
DDC	DIRECT DIGITAL CONTROLS	HVAC	HEATING, VENTILATION, & AIR CONDITIONING	UG	UNDERGROUND		
DISC.	DISCONNECT			UNO	UNLESS OTHERWISE NOTED		

SCOPE OF WORK:

1. GENERAL: THE "SOUTH TEXAS I.S.D. MERCEDES VOCATIONAL BUILDING RENOVATIONS" CONSISTS OF AN EXISTING SINGLE-STORY BUILDING, APPROXIMATE 19,146 S.F. THIS BUILDING IS GENERALLY 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 A COMPLETE OPERATIONAL ELECTRICAL DISTRIBUTION SYSTEM. MAJOR ITEMS OF WORK INCLUDE, BUT ARE NOT LIMITED TO:
   (a) ELECTRICAL SERVICE:
      (i) CONNECT TO EXISTING UTILITY PAD MOUNTED TRANSFORMER. COORDINATE WORK WITH AEP SCHOOL STAFF.
      (ii) ENGAGE WITH AEP STAFF RIGHT AWAY TO ENSURE SMOOTH PROCESS OF NEW DISCONNECT INSTALLATION
   (b) INTERIOR AND EXTERIOR LIGHTING SYSTEMS: PROVIDE LED TYPE, SEE LIGHT FIXTURE SCHEDULE AND SPECIFICATIONS.
   (c) LIGHTING CONTROLS (SWITCHES, VACANCY SENSORS, ETC.): PROVIDE AS NOTED ON PLANS SPECIFICATIONS. IN SOME CASES, THEY WILL BE CEILING MOUNTED AND OTHERS WALL MOUNTED. IT'S THE INTENT FOR THEM TO BE WIRED TO AUTOMATICALLY CONTROL THE LUMINAIRES IN THEIR RESPECTIVE AREAS.
   (d) POWER SYSTEMS: PROVIDE MISCELLANEOUS DUPLEX RECEPTACLES, RECEPTACLES FOR AUTOMOTIVE EQUIPMENT, AND HARDWIRE CONNECTIONS FOR POWER TO AUTOMOTIVE, H.V.A.C. AND PLUMBING EQUIPMENT.
   (e) FIRE ALARM SYSTEM: EXPAND/MODIFY/UPGRADE EXISTING ADDRESSABLE CONTROL PANEL. PROVIDE MANUAL, AUTOMATIC INITIATION DEVICES AND INDICATING DEVICES TO COMPLY WITH TDLR.
   (f) SCHOOL INTERCOM SYSTEM: EXPAND/MODIFY/UPGRADE EXISTING. PROVIDE/RELOCATE SPEAKERS TO TRANSMIT GENERAL ANNOUNCEMENTS.
   (g) INTRUSION DETECTION SYSTEM: EXPAND/MODIFY/UPGRADE EXISTING CONTROL PANEL. PROVIDE MOTION DETECTORS AND MAGNETIC CONTACTS AS NOTED ON DRAWINGS.
   (h) VOICE AND DATA COMMUNICATION CABLING EQUIPMENT: PROVIDE ROUGH-INS ONLY. CABLING, CONNECTORS, PATCH PANELS, RACKS, ETC. PROVIDED BY OWNER.
   (i) ACCESS CONTROL AND CCTV SYSTEM: PROVIDE ROUGH INS ONLY. CAMERAS, CARD READERS, RELEASE BUTTONS, SOFTWARE PROGRAMMING AND EQUIPMENT INCLUDING POWER TO SECURED DOORS AND POWER SUPPLIES PROVIDED BY OWNER.
   (j) COMMISSIONING: PROVIDE FOR THE LIGHTING EQUIPMENT AND LIGHTING CONTROLS AS REQUIRED PER IECC 2018.

GENERAL SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO
	DISCONNECT SWITCH – NON FUSED	AS REQUIRED
	DISCONNECT SWITCH – FUSED	AS REQUIRED
	COMBINATION MOTOR STARTER/DISCONNECT SWITCH	AS REQUIRED
	EQUIPMENT CONNECTION	AS REQUIRED
	ELECTRICAL PANELBOARD – SURFACE MOUNTED	AS REQUIRED
SPD	SURGE PROTECTION DEVICE	AS REQUIRED
	UNDERGROUND RACEWAY	AS REQUIRED
	CONCEALED RACEWAY	AS REQUIRED
	CONDUIT OR EMT HOMERUN TO PANELBOARD CONCEALED IN WALLS OR ABOVE CEILING. LONG CROSSMARKS DENOTE NUMBER OF "HOT" CONDUCTORS SHORT CROSSMARKS INDICATE NEUTRALS AND DOTS INDICATE NUMBER OF GROUND CONDUCTORS. ARROW INDICATES HOME RUN TO ELECTRICAL PANEL.	AS REQUIRED
	RED KNOB EMERGENCY PUSHBUTTON – SEE DETAIL	48"AFF

WIRING DEVICES SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
S	SINGLE POLE TOGGLE SWITCH – HUBBELL MODEL #HBL1221W	48"AFF
S_3	THREE WAY TOGGLE SWITCH – HUBBELL MODEL #HBL1223W	48"AFF
S_4	FOUR WAY TOGGLE SWITCH – HUBBELL MODEL #HBL1224W	48"AFF

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

FIRE ALARM SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
FS	FIRE ALARM MANUAL PULLSTATION – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	48"AFF
VA VA	FIRE ALARM STROBE HORN CEILING OR WALL MOUNTED – PROVIDE 15/75 CANDELA U.N.O. – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	80"AFF
V V	FIRE ALARM STROBE LIGHT CEILING OR WALL MOUNTED – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	80"AFF
SD HSD	FIRE ALARM SMOKE DETECTOR CEILING OR WALL MOUNTED – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	CLG.
HD HHD	FIRE ALARM HEAT DETECTOR CEILING OR WALL MOUNTED – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	CLG.

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

CCTV SYSTEM SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	INDOOR CAMERA – PROVIDE BACK BOX WITH 1" RACEWAY STUBBED INTO ACCESSIBLE CLG. WITH PULL WIRE – SEE DETAIL.	------
OD	OUTDOOR CAMERA – PROVIDE BACK BOX WITH 1" RACEWAY STUBBED INTO ACCESSIBLE CLG. WITH PULL WIRE – SEE DETAIL.	------

NOTES:
1.) PRIOR TO ANY ROUGH-IN COORDINATE EXACT LOCATION OF BACK BOXES WITH CCTV SYSTEM SUPPLIER.

LIGHTING SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	2'X4' LIGHT FIXTURE – TYPE AS NOTED	- - - -
	EMERGENCY 2'X4' LIGHT FIXTURE–TYPE AS NOTED CONNECT BATTERY PACK TO BE ON AT ALL TIMES (UNSWITCHED)	- - - -
	SURFACE/WRAPAROUND LIGHT FIXTURE	- - - -
	SURFACE/WRAPAROUND EMERGENCY LIGHT FIXTURE CONNECT BATTERY PACK TO BE ON AT ALL TIMES (UNSWITCHED)	- - - -
	SURFACE/STRIP LIGHT FIXTURE	- - - -
	SINGLE FACE EXIT SIGN CEILING OR WALL MOUNTING (DIRECTIONAL ARROWS WHERE INDICATED)	12" ABV. EGRESS OPENING
	DOUBLE FACE EXIT SIGN CEILING OR WALL MOUNTING (DIRECTIONAL ARROWS WHERE INDICATED)	12" ABV. EGRESS OPENING
	EMERGENCY LIGHTING UNIT	8'-0"AFF
	WALL MOUNT LIGHT FIXTURE – TYPE AS NOTED	

NOTES:
1.) REFERENCE LIGHT FIXTURE SCHEDULE FOR ALL MOUNTING HEIGHTS.

WIRING DEVICES SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	DUPLEX TAMPER RESISTANT RECEPTACLE – HUBBELL MODEL #BR20WTR (WHITE)	18"AFF
GFCI	DUPLEX RECEPTACLE HOSPITAL GRADE TAMPER RESISTANT W/ GROUND FAULT INTERRUPTING TYPE – HUBBELL MODEL #GFRST83W (WHITE)	18"AFF
GFCI WCP	DUPLEX RECEPTACLE TAMPER RESISTANT W/ GROUND FAULT INTERRUPTING TYPE – HUBBELL MODEL #GFTWRST20W (WHITE) AND WHILE IN USE WEATHERPROOF COVER – HUBBELL MODEL #WP26EH	18"AFF
AC	DUPLEX RECEPTACLE TAMPER RESISTANT – HUBBELL MODEL #B300WTR (WHITE) MOUNT @ +4" HORIZONTALLY ABOVE COUNTER BACKSPLASH (U.N.O.)	4"ACB
	SPECIAL RECEPTACLE – TYPE AS NOTED	18"AFF
	JUNCTION BOX W/ BLANK COVERPLATE	AS REQUIRED
	POLYMER CONCRETE PULL BOX W/ LOGO COVER – SEE DETAIL	AS REQUIRED
	QUADPLEX TAMPER RESISTANT RECEPTACLE – HUBBELL MODEL #BR20WTR (WHITE)	18"AFF
P	PENDANT DUPLEX RECEPTACLE TAMPER RESISTANT W/ GROUND FAULT INTERRUPTING TYPE – HUBBELL MODEL #GFRST83W (WHITE)	SEE DETAIL
P	PENDANT QUADPLEX RECEPTACLE TAMPER RESISTANT W/ GROUND FAULT INTERRUPTING TYPE – HUBBELL MODEL #GFRST83W (WHITE)	SEE DETAIL
CR	CORD REEL RECEPTACLE	CLG.

NOTES:
1.) U.N.O. INDICATES UNLESS NOTED OTHERWISE.
18" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.
AC INDICATES 4" ABOVE COUNTER TO BOTTOM OF DEVICE.

INTERCOM SYSTEMS SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	INTERCOM OUTDOOR HORN WEATHER PROOF – PROVIDE BACKBOX W/ 1/2"C AND PULLWIRE.	9'-6"AFF
S	INTERCOM SPEAKER LAY-IN	CLG.
S	INTERCOM SPEAKER SURFACE MOUNT	CLG.

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

DOOR ACCESS SYSTEMS SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
P	DOOR POWER SUPPLY – CONNECT TO NEAREST 120V NON-GFCI CIRCUIT.	12" ABC
ML	CONNECT DOOR MAGNETIC LOCK – PROVIDE BACK BOX WITH 1/2" RACEWAY STUBBED TO POWER SUPPLY ABOVE ACCESSIBLE CLG.	12" ABC
RB	CONNECT DOOR RELEASE BUTTON – BOSCH MODEL #47107). PROVIDE BACK BOX WITH 1/2" RACEWAY STUBBED TO POWER SUPPLY ABOVE ACCESSIBLE CLG.	48"AFF
CR	CONNECT CARD READER – PROVIDE BACK BOX WITH 1/2" RACEWAY STUBBED INTO ACCESSIBLE CLG. WITH PULL WIRE.	48"AFF
RS	CONNECT RELEASE SENSOR – PROVIDE BACK BOX WITH 1/2" RACEWAY STUBBED INTO ACCESSIBLE CLG. WITH PULL WIRE.	90"AFF
MC	CONNECT DOOR MAGNETIC CONTACT.	---

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.
REFER TO DOOR ACCESS SYSTEM DETAIL.

SPECIAL SYSTEMS SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	DATA OUTLET/VOICE OVER IP – PROVIDE BACK BOX WITH 1" RACEWAY STUBBED INTO ACCESSIBLE CLG. WITH PULL WIRE – SEE DETAIL.	18"AFF

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

LIGHTING CONTROL SYMBOLS:

	WALL SWITCH – LEVITON MODEL #PLVSW-1LW	48"AFF
	SWITCHING RELAY – LEVITON MODEL #OPP20-002. CONTROL LIGHTING LOADS.	ABV. CLG.
VC	WIRELESS VACANCY SENSOR – LEVITON MODEL #OSC20-MWW	CLG.

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE; ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE. REFERENCE LIGHTING CONTROL SCHEMATIC DETAILS FOR ALL LUTRON CONTROLS WIRING REQUIREMENTS.

INTRUSION DETECTION SYMBOL LEGEND:

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
MD	INTRUSION DETECTION MOTION DETECTOR FULL COVERAGE TYPE – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	9'-0"AFF
DC	INTRUSION DETECTION DOOR MAGNETIC CONTACT – PROVIDE WITH 1/2"C AND PULLWIRE.	- - - -
DC OH	INTRUSION DETECTION OVERHEAD DOOR MAGNETIC CONTACT – PROVIDE BACKBOX WITH 1/2"C AND PULLWIRE.	- - - -

NOTES:
1.) 48" AFF INDICATES TO TOP OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

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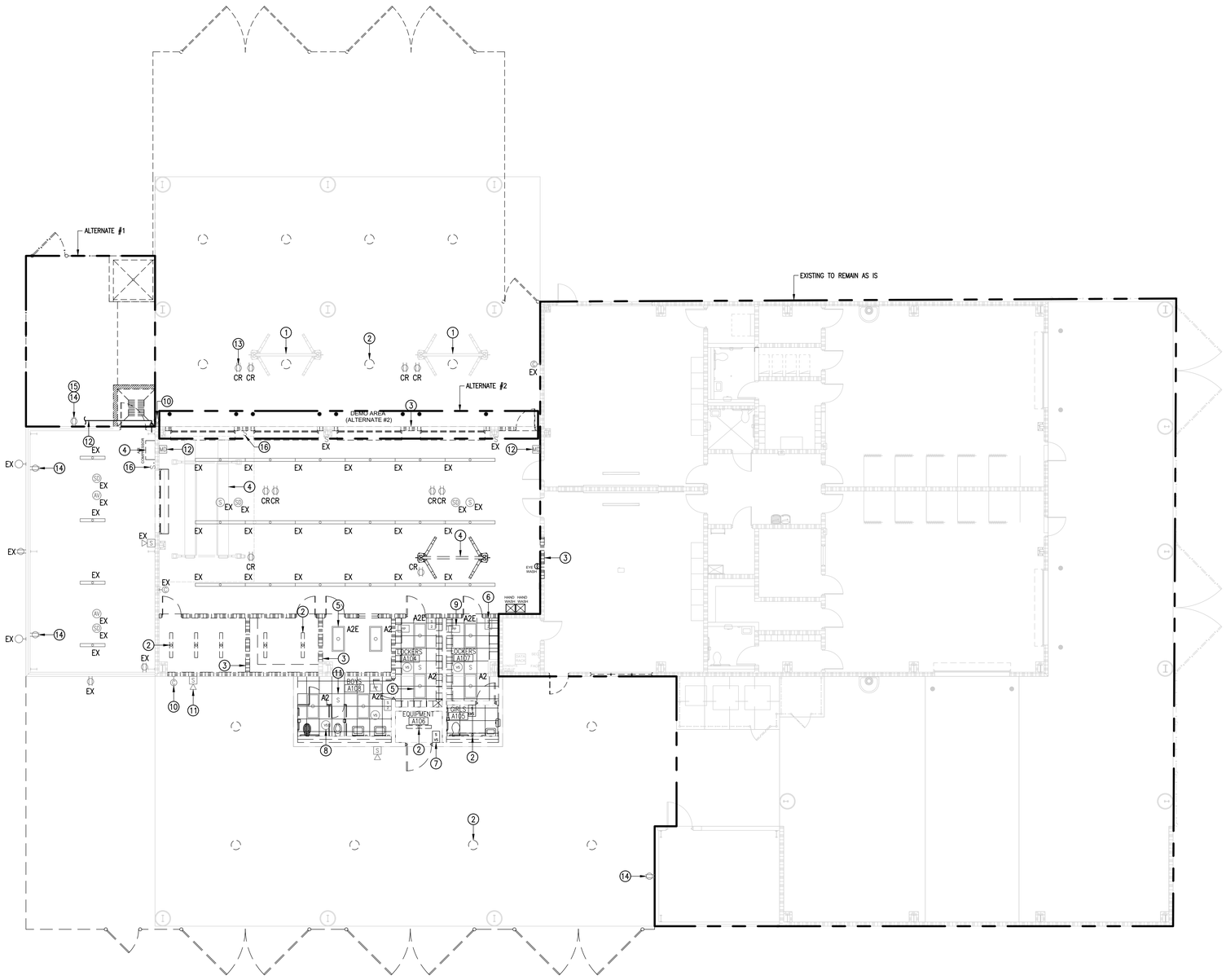
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01 DEMOLITION LIGHTING AND ELECTRICAL FLOOR PLAN
SCALE :1/8" = 1'-0"

PLAN NORTH

DEMOLITION GENERAL NOTES:

1. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR PHASING REQUIREMENTS.
2. THE EXTENT 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.
3. 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.
4. 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.
5. REFER TO ARCHITECTURAL DEMOLITION DRAWINGS FOR WALL AND CEILINGS TO BE REMOVED.
6. PROVIDE BLANK COVERPLATE FOR UNUSED BACK BOXES.
7. ITEMS DESIGNATED WITH AN "EX" ARE EXISTING TO REMAIN AS IS.

DEMOLITION KEYED NOTES:

1. DISCONNECT EXISTING EQUIPMENT ALONG WITH RELATED WIRING, RACEWAYS AND SUPPORT HARDWARE. EQUIPMENT TO BE CONNECTED TO A NEW POWER SOURCE.
2. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURE ALONG WITH RELATED WIRING, RACEWAYS AND SUPPORT HARDWARE – TYPICAL.
3. DISCONNECT AND REMOVE ANY AND ALL EXISTING INTERIOR LIGHTING FIXTURES, ELECTRICAL AND SPECIAL SYSTEMS DEVICES ALONG WITH RELATED RACEWAYS, WIRING AND SUPPORT HARDWARE LOCATED ON WALLS TO BE REMOVED – TYPICAL.
4. DISCONNECT EXISTING EQUIPMENT. REMOVE RELATED RACEWAYS, WIRING AND SUPPORT HARDWARE.
5. DISCONNECT AND REMOVE EXISTING LIGHT FIXTURE ALONG WITH RELATED WIRING, RACEWAYS AND SUPPORT HARDWARE – TYPICAL.
6. DISCONNECT AND REMOVE EXISTING WALL SWITCH ALONG WITH RELATED RACEWAYS, WIRING AND SUPPORT HARDWARE – TYPICAL.
7. DISCONNECT AND REMOVE EXISTING VACANCY SWITCH – TYPICAL.
8. DISCONNECT AND RELOCATE EXISTING VACANCY SENSOR – TYPICAL.
9. DISCONNECT AND REMOVE EXISTING POWER PACK ALONG WITH RELATED RACEWAYS, WIRING AND SUPPORT HARDWARE – TYPICAL.
10. DISCONNECT AND RELOCATE EXISTING CAMERA – TYPICAL.
11. DISCONNECT AND RELOCATE EXISTING INTERCOM DEVICE – TYPICAL.
12. DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED RACEWAY ALONG WITH RELATED WIRING AND SUPPORT HARDWARE.
13. DISCONNECT AND REMOVE EXISTING CORD REEL – TYPICAL.
14. DISCONNECT AND REMOVE EXISTING WIRING DEVICE ALONG WITH RELATED RACEWAY, WIRING AND SUPPORT HARDWARE.
15. IF ALTERNATE IS NOT ACCEPTED; WIRING DEVICE SHALL REMAIN AS IS.
16. IF ALTERNATE IS ACCEPTED; DISCONNECT AND RELOCATE SOURCE CAPTURE EXHAUST FAN SWITCH.
17. DISCONNECT AND RELOCATE EXISTING LIGHT SWITCH.

WALL LEGEND	
	DENOTES EXISTING WALL TO BE DEMOLISHED.
	DENOTES EXISTING WALL TO REMAIN.

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MERCEDES , TEXAS

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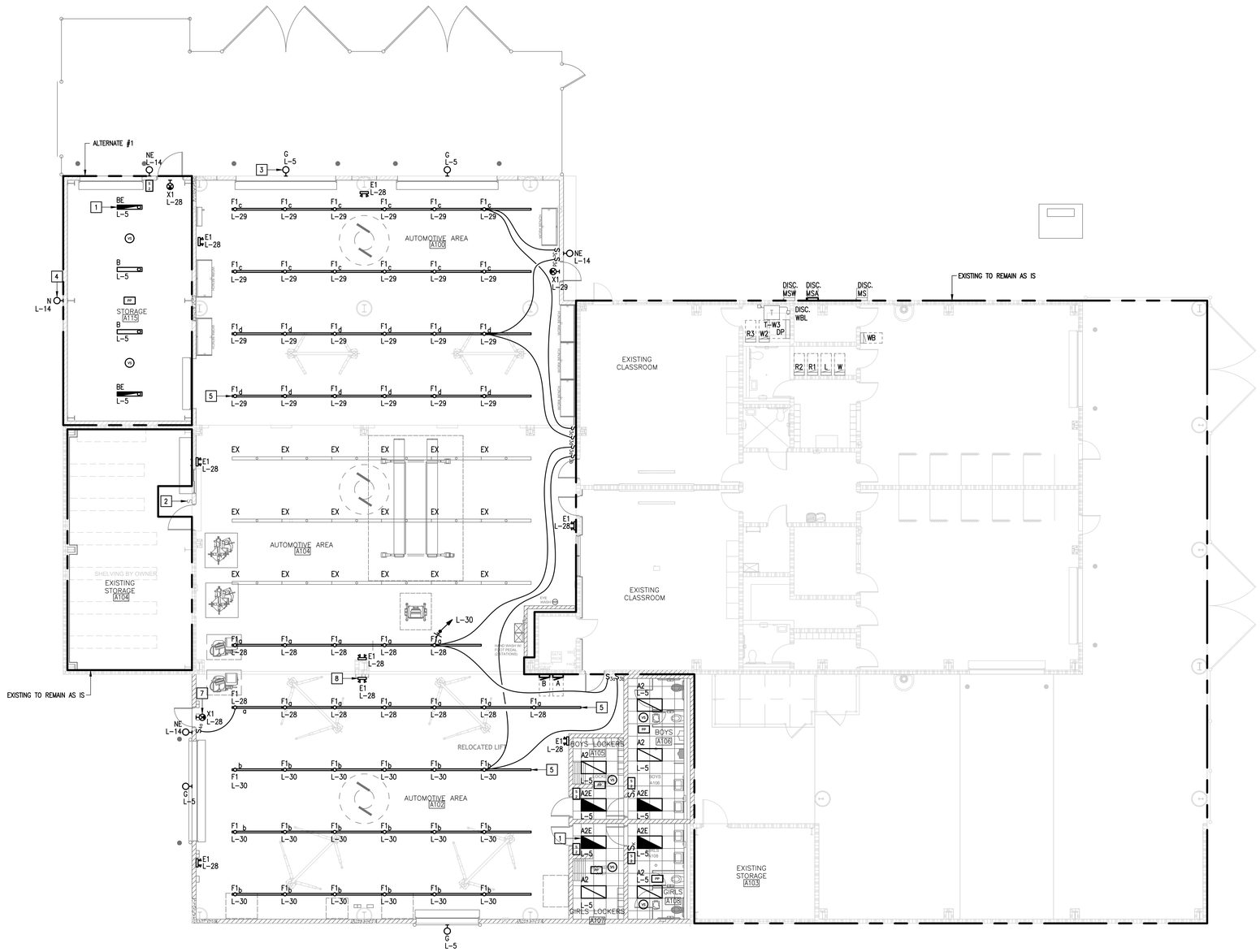
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GENERAL NOTES:

1. ALL BACK BOXES AND RACEWAYS SHALL BE INSTALLED FLUSH IN WALLS. THERE SHALL BE NO SURFACE MOUNTED BACK BOXES OR RACEWAYS.
2. LIGHTING BRANCH CIRCUIT HOMERUNS SHALL BE 3/4" – 2#12 & #12G. 20A/277V HOMERUNS EXCEEDING 200FT THE WIRE SIZE SHALL BE #10 & #8 FOR 275'.
3. INTERIOR LIGHTING CONTROLS SHALL BE BY VACANCY SENSORS.
4. EXTERIOR LIGHTING CONTROLS SHALL BE BY EXISTING TIME CLOCK AND OR PHOTO CELL.
5. PROVIDE 0-10V SIGNAL WIRING TO EACH DIMMED LIGHT FIXTURE DRIVER AND WALL SWITCH.
6. EACH 20A/1P BRANCH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL.

KEYED NOTES:

1. CONNECT EMERGENCY BATTERY PACK TO BE CHARGING AT ALL TIMES (UNSWITCHED). LIGHT FIXTURE SHALL BE OPERATED BY THE CORRESPONDING SWITCH – TYPICAL.
2. EXISTING WALL SWITCH AT NEW LOCATION –TYPICAL.
3. MOUNT FIXTURE TYPE "G" AT 12'–0" AFF – TYPICAL.
4. MOUNTING HEIGHT TO BE SAME AS EXISTING. CONNECT AND SWITCH VIA EXISTING EXTERIOR LIGHTING CIRCUIT.
5. SUSPEND LIGHT FIXTURE TYPE "F1" AT THE SAME HEIGHT AS THE EXISTING ADJACENT SHOP LIGHTS. PROVIDE THREADED RODS AND UNISTRUT SUPPORT – TYPICAL.
6. EXISTING LIGHT SWITCH AT NEW LOCATION. PROVIDE NEW WIRING.
7. CONNECT EXIT LIGHT EMERGENCY BATTERY PACK TO BE CHARGING AT ALL TIMES (UNSWITCHED) – TYPICAL.
8. MOUNT LIGHT FIXTURE TYPE "E1" AT 12'–0" AFF.



01 LIGHTING FLOOR PLAN
SCALE : 1/8" = 1'-0"

PLAN NORTH

WALL LEGEND	
	DENOTES EXISTING WALL TO REMAIN.
	DENOTES NEW WALL.

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Drawn By:	C.G.
Job No.	25c22
Sheet:	E3.01

EQUIPMENT CONNECTION SCHEDULE:

ITEM #	ITEM DESCRIPTION	LOAD	VOLTAGE	CONNECTION REQUIRED	BRANCH CIRCUIT
CURRENT EQUIPMENT					
Ⓐ	ROTARY 2-POST LIFT (3)	2HP/30A	208V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION; 30A, 2PNF, 240V, NEMA 1 DISCONNECT	3/4" - 2#12 & #10G
Ⓑ	ALIGNMENT RACK (1)	3HP/20A	208V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION; 30A, 2PNF, 240V, NEMA 1 DISCONNECT	3/4" - 2#10 & #10G
Ⓒ	WHEEL BALANCER (1)	10A	208V/1PH/60HZ	PROVIDE A SPECIAL RECEPTACLE NEMA L6-20R.	1/2" - 2#12 & #12G
Ⓓ	BRAKE LATHE (1)	12A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓔ	COATS ALIGNMENT (1)	15A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE PENDANT MOUNTED.	1/2" - 2#12 & #12G
Ⓕ	COATS TIRE CHANGER (1)	15A	208V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION.	1/2" - 2#12 & #12G
Ⓖ	MILLER WELDER (1)	40.4A	208V/1PH/60HZ	PROVIDE A SPECIAL RECEPTACLE NEMA 14-50R.	3/4" - 3#6 & #10G
Ⓗ	BENCH TOP GRINDER (3)	4.2A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓘ	CHOP SAW (2)	15A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓙ	BATTERY CHARGER (6)	1A	120V/1PH/60HZ	PROVIDE A 20A GFCI QUADPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓚ	REFRIGERANT RECOVERY (6)	12A	120V/1PH/60HZ	PROVIDE A 20A GFCI QUADPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓛ	DRILL PRESS (1)	9A	120V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION; 30A, 2PNF, 240V, NEMA 1 DISCONNECT	1/2" - 2#12 & #12G
Ⓜ	BATTERY CHARGER (10)	2.1A	120V/1PH/60HZ	PROVIDE A 20A GFCI QUADPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓝ	ELECTROMAGNETISM TRAINER (2)	1.3A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓞ	DC CIRCUIT TRAINER (14)	4A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓟ	LIGHTING SYSTEM TRAINER (1)	30A	120V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION.	3/4" - 2#10 & #10G
Ⓠ	ENGINE TRAINER (1)	1.5A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓡ	SMART WASHER (1)	6.3A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓢ	BRAKE WASHER (4)	6.3A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
Ⓣ	PRESSURE WASHER (1)	20A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
NEW ORDERED EQUIPMENT					
①	BOMBER BRAKE LATHE (1)	15A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
②	ADJUSTABLE 2-POST LIFT (3)	20A	208V/1PH/60HZ	PROVIDE A HARDWIRE CONNECTION; 30A, 2PNF, 240V, NEMA 1 DISCONNECT	3/4" - 2#10 & #10G
⑤	TIRE CHANGER (1)	20A	220V/1PH/60HZ	PROVIDE A SPECIAL RECEPTACLE NEMA L6-20R.	1/2" - 2#12 & #12G
⑥	WHEEL BALANCER SWT (1)	15A	220V/XPH/60HZ	PROVIDE A HARDWIRE CONNECTION.	1/2" - 2#12 & #12G
⑦	PROCUT ON CAR LATHE (1)	5.8A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑧	PROCUT ON CAR LATHE (1)	15.54A	48V/XPH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑨	FLUID EXCHANGER (2)	15A	110V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑩	COOLANT FLUID EXCHANGER (2)	15A	110V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑪	BRAKE FLUSH SYSTEM (4)	15A	110V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑫	STEERING FLUID EXCHANGER (2)	15A	110V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑬	NETWORK TRAINER (1)	15A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑭	SENSOR TRAINER (5)	15A	120V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G
⑮	BRAKE TRAINER (1)	20A	110V/1PH/60HZ	PROVIDE A 20A GFCI DUPLEX RECEPTACLE.	1/2" - 2#12 & #12G

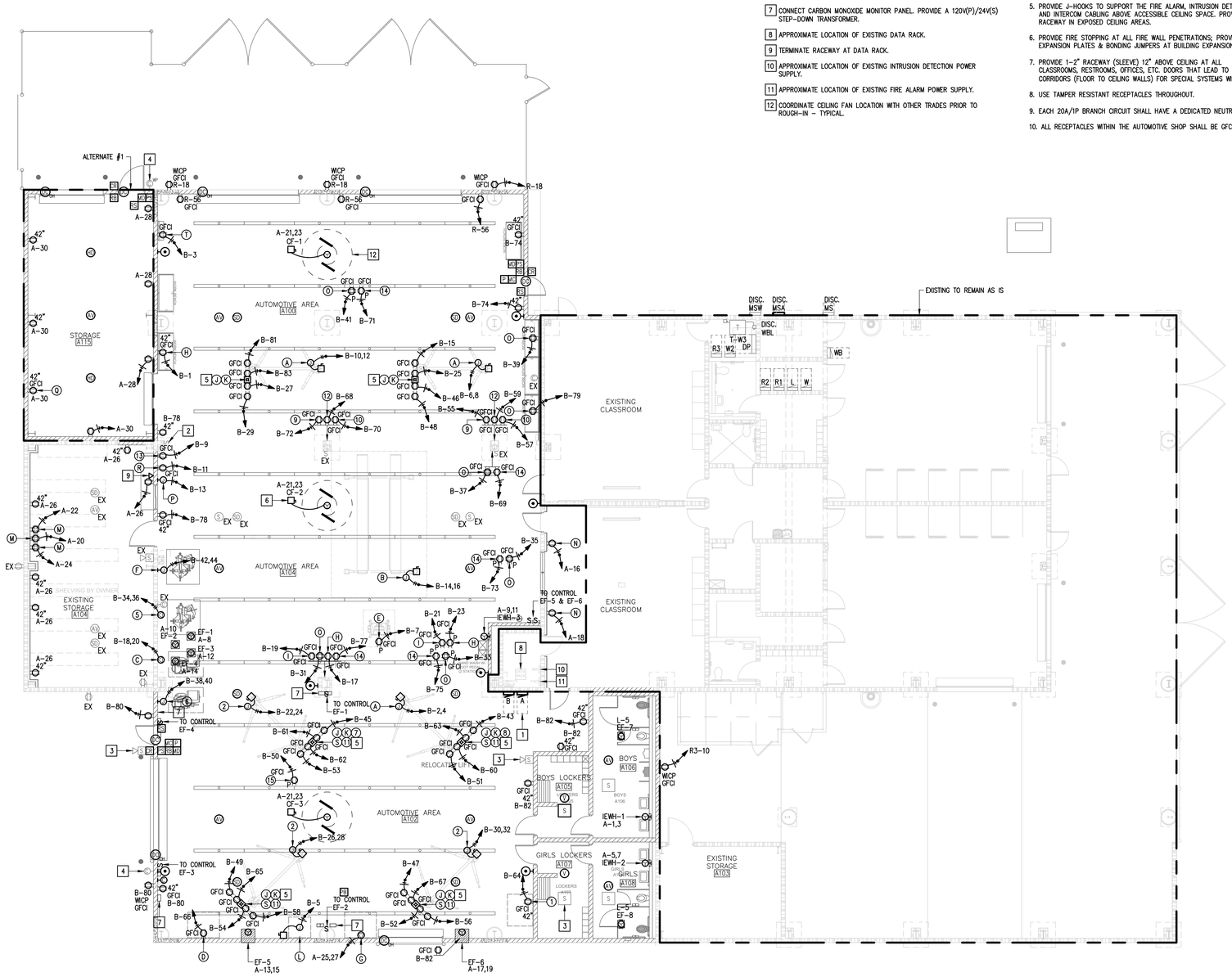
NOTES:
1.) -

ELECTRICAL KEYED NOTES:

1. NO DUCTWORK OR PIPING TO BE ROUTED ABOVE PANELBOARDS. COORDINATE WITH OTHER TRADES - TYPICAL.
2. EXISTING SOURCE CAPTURE EXHAUST FAN SWITCH AT NEW LOCATION. PROVIDE NEW WIRING.
3. EXISTING INTERCOM DEVICE AT NEW LOCATION. PROVIDE NEW CABLING.
4. EXISTING CCTV CAMERA AT NEW LOCATION. PROVIDE ROUGH-IN ONLY.
5. PROVIDE STEEL COLUMN FOR MOUNTING WIRING DEVICES. SEE DETAIL.
6. PROVIDE UNISTRUT SUPPORT SECURED TO STRUCTURAL STEEL FOR MOUNTING CEILING FAN DISCONNECT - TYPICAL. SEE DETAIL.
7. CONNECT CARBON MONOXIDE MONITOR PANEL. PROVIDE A 120V(P)/24V(S) STEP-DOWN TRANSFORMER.
8. APPROXIMATE LOCATION OF EXISTING DATA RACK.
9. TERMINATE RACEWAY AT DATA RACK.
10. APPROXIMATE LOCATION OF EXISTING INTRUSION DETECTION POWER SUPPLY.
11. APPROXIMATE LOCATION OF EXISTING FIRE ALARM POWER SUPPLY.
12. COORDINATE CEILING FAN LOCATION WITH OTHER TRADES PRIOR TO ROUGH-IN - TYPICAL.

GENERAL NOTES:

1. ALL BACK BOXES AND RACEWAYS SHALL BE INSTALLED FLUSH IN WALLS. THERE SHALL BE NO SURFACE MOUNTED BACK BOXES OR RACEWAYS.
2. ELECTRICAL BRANCH CIRCUIT HOMERUNS SHALL BE 3/4" - 2#12 #12G. 20A/120V HOMERUNS EXCEEDING 100FT, THE WIRE SIZE SHALL BE #10 & #8 FOR 175'.
3. HOMERUNS - INSTALL NO MORE THAN THREE PER RACEWAY (INCLUDING LIGHTING BRANCH CIRCUITS); 3 INSULATED "HOT", 3 INSULATED "NEUTRAL AND 1 SHARED "GROUND".
4. PROVIDE ALL ELECTRICAL RECEPTACLES INSTALLED WITH THE GROUND OPENING IN THE "UP" POSITION.
5. PROVIDE J-HOOKS TO SUPPORT THE FIRE ALARM, INTRUSION DETECTION, AND INTERCOM CABLING ABOVE ACCESSIBLE CEILING SPACE. PROVIDE RACEWAY IN EXPOSED CEILING AREAS.
6. PROVIDE FIRE STOPPING AT ALL FIRE WALL PENETRATIONS; PROVIDE EXPANSION PLATES & BONDING JUMPERS AT BUILDING EXPANSION JOINTS.
7. PROVIDE 1-2" RACEWAY (SLEEVE) 12" ABOVE CEILING AT ALL CLASSROOMS, RESTROOMS, OFFICES, ETC. DOORS THAT LEAD TO CORRIDORS (FLOOR TO CEILING WALLS) FOR SPECIAL SYSTEMS WIRING.
8. USE TAMPER RESISTANT RECEPTACLES THROUGHOUT.
9. EACH 20A/1P BRANCH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL.
10. ALL RECEPTACLES WITHIN THE AUTOMOTIVE SHOP SHALL BE GFCI TYPE.



01 ELECTRICAL FLOOR PLAN
SCALE : 1/8" = 1'-0"

WALL LEGEND	
	DENOTES EXISTING WALL TO REMAIN.
	DENOTES NEW WALL.

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VOCATIONAL BUILDING RENOVATIONS
MERCEDES , TEXAS



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Architects-Planners
Interior Designers

Date:	03/21/2025
Scale:	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	C.G.
Job No.	25y22
Sheet:	E4.01

LUMINAIRE SCHEDULE

CALLOUT	LAMP	DESCRIPTION	BALLAST	MOUNTING	MODEL	INPUT WATTS	VOLTS	NOTE 1	LUMENS / LAMP	LUMEN MAINTENANCE	HOURS
A2	LED	2'X4' LAY-IN FLAT PANEL	0-10V	RECESSED	ALS: CSP 24-BACKLIT	40	120V 1P 2W		5000	L70	100,000
A2E	LED	2'X4' LAY-IN FLAT PANEL	0-10V	RECESSED	ALS: CSP 24-BACKLIT-EMB-H08170	40	120V 1P 2W	PROVIDE WITH AN EMERGENCY BATTERY PACK.	5000	L70	100,000
B	LED	4' LINEAR LIGHT	0-10V	SURFACE	DAY-BRITE: FSW455L840-UNV-DIM	40	120V 1P 2W		5325	L70	50,000
BE	LED	4' LINEAR LIGHT	0-10V	SURFACE	DAY-BRITE: FSW455L840-UNV-DIM-EMLED	40	120V 1P 2W	PROVIDE WITH AN EMERGENCY BATTERY PACK.	5325	L70	50,000
E1	LED	EMERGENCY LIGHTING UNIT		WALL	EELP: EM20-E-HO-RC-SD	5	120V 1P 2W	PROVIDE WITH A NICAD BATTERY.	0		
F1	LED	LINEAR 8' STRIP LIGHT	0-10V	SURFACE	ALS: CSL 8SMC WH UD	90	120V 1P 2W	PROVIDE UL LISTED FOR DAMP LOCATIONS.	11790	L70	100,000
F1E	LED	LINEAR 8' STRIP LIGHT	0-10V	SURFACE	ALS: CSL 8SMC WH UD EMB-8W-B	91	120V 1P 2W	PROVIDE UL LISTED FOR DAMP LOCATIONS AND WITH AND EMERGENCY BATTERY PACK.	11790	L70	100,000
G	LED	WALLPACK	0-10V	SURFACE	ALS: CSW 120 SC DB UP-D	120	120V 1P 2W	PROVIDE UL LISTED FOR WET LOCATIONS & WITH A METACLIC SILVER FINISH.	16500	L70	50,000
N	LED	WALLPACK	0-10V	SURFACE	ILP: VWM-3L/4L/5L-U-CCTS-T4-X	142	120V 1P 2W	PROVIDE UL LISTED FOR WET LOCATIONS & WITH A METACLIC SILVER FINISH.	5631	L70	100,000
NE	LED	WALLPACK	0-10V	SURFACE	ILP: VWM-3L/4L/5L-U-CCTS-T4-X-EMCT8	142	120V 1P 2W	PROVIDE UL LISTED FOR WET LOCATIONS & WITH A METACLIC SILVER FINISH.	5631	L70	100,000
X1	LED	SINGLE SIDED EXIT SIGN		WALL/CEILING	EELP: CA1RWEMSD	3	120V 1P 2W	PROVIDE WITH A UNIVERSAL MOUNTING CANOPY, LIGHT EMITTING DIODES, & A NI-CAD BATTERY PACK.	0		

GENERAL NOTES:
1. OTHER LIGHT FIXTURE MANUFACTURERS THAN THOSE LISTED ON THIS SCHEDULE ARE REQUIRED TO OBTAIN PRIOR APPROVAL BY SUBMITTING CUT SHEETS OF THEIR SUBSTITUTIONS AT LEAST (10) BUSINESS DAYS PRIOR TO BID. CUT SHEETS SHALL INDICATE/HIGHLIGHT PHOTOMETRIC CURVE, EFFICIENCY & CONSTRUCTION FOR DIRECT COMPARISON WITH SPECIFIED FIXTURES.
2. EXTRA MATERIALS: SEE SPECIFICATIONS.
3. EMERGENCY BATTERY PACKS SHALL BE COMPLETE FACTORY INSTALLED WITH NI-CAD BATTERY, CHARGER INDICATING LIGHT, ELECTRONIC CIRCUITRY, 1400 LUMENS OUTPUT, 90 MINUTES DURATION & FIVE FULL YEARS WARRANTY.
4. INCLUDE VERIFICATION OF LIGHT FIXTURE EFFECIANCY IN LIGHT FIXTURE SUBMITTALS BY ATTACHING ONE OF THE FOLLOWING:
* SCREENSHOT OF DLC WEBSITE LISTING FOR SPECIFIC LIGHT FIXTURE. CAN BE FOUND AT HTTPS://WWW.DESIGNLIGHTS.ORG
* SCREENSHOT OF ENERGY STAR WEBSITE LISTING FOR SPECIFIC LIGHT FIXTURE. CAN BE FOUND AT HTTPS://WWW.ENERGYSTAR.GOV
* PART EFFICIENCY DOCUMENTATION IN THE FORM OF LM-79 OR LM-80 DOCUMENTS WITH ADDITIONAL DOCUMENTATION DISPLAYING THE LINK BETWEEN THE PART AND THE LIGHT FIXTURE.



01 LIGHTING FIXTURE TYPE "A2E" & "A2" IMAGE
SCALE : NONE



02 LIGHTING FIXTURE TYPE "B", "BE" IMAGE
SCALE : NONE



03 LIGHT FIXTURE TYPE "F1E", "F1" IMAGE
SCALE : NONE



04 LIGHTING FIXTURE TYPE "G"IMAGE
SCALE : NONE



05 LIGHTING FIXTURE TYPE "NE" & "N" IMAGE
SCALE : NONE



06 LIGHTING FIXTURE TYPE "E1" IMAGE
SCALE : NONE



07 LIGHTING FIXTURE TYPE "X1" IMAGE
SCALE : NONE



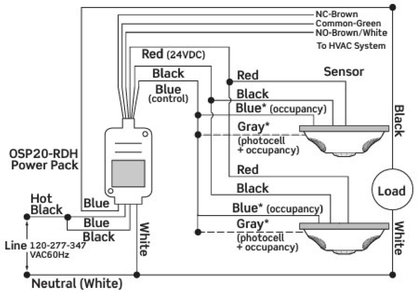
08 LEVITON SWITCH IMAGE
SCALE : NONE



09 LEVITON POWER PACK IMAGE
SCALE : NONE



10 LEVITON VACANCY SENSOR IMAGE
SCALE : NONE



11 LEVITON CEILING SENSOR WIRING DIAGRAM
SCALE : NONE

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MERCEDES, TEXAS

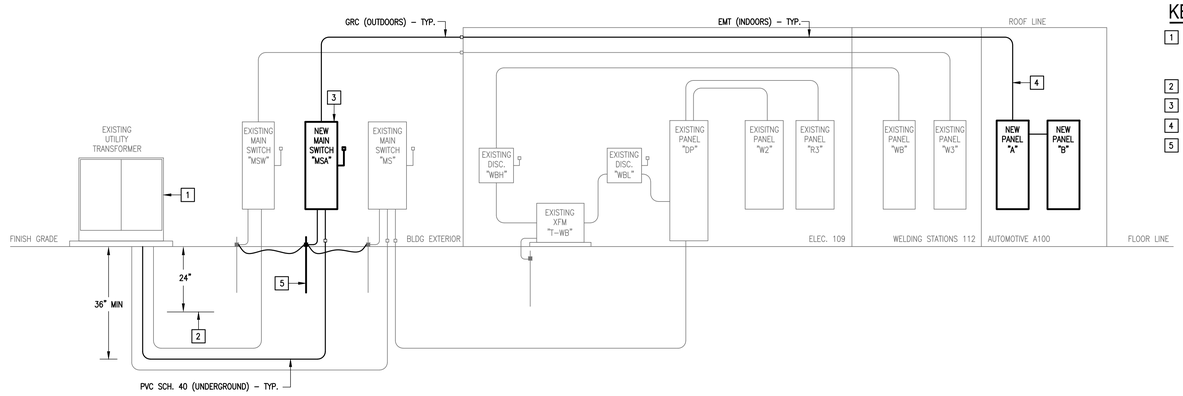
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Architects-Planners
Interior Designers

Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: C.G.
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01 ELECTRICAL RISER DIAGRAM
SCALE: N.T.S.

ELECTRICAL RISER DIAGRAM KEYED NOTES:

1. EXISTING ELECTRIC UTILITY (A.E.P.) PAD MOUNT TRANSFORMER. NOTIFY OWNER NO FEWER THAN SEVEN DAYS IN ADVANCE OF PROPOSED INTERRUPTION OF SERVICE. COORDINATE UP SIZING WITH UTILITY COMPANY.
2. PROVIDE CONTINUOUS DETECTABLE UNDERGROUND WARNING TAPE.
3. PROVIDE NEW 400A, 3P3F, 400AF, S/N, NEMA 3R DISCONNECT.
4. PROVIDE FEEDER; REFER TO FEEDER SCHEDULE.
5. PROVIDE 3/4" – #1/0 BARE COPPER GROUND ELECTRODE CONDUCTOR AND 3/4" X 10' COPPER CLAD GROUND ROD.

EXHAUST FAN CONNECTION SCHEDULE:

DESIGNATION	HP/WATTS	FLA	VOLTAGE	CONNECTION FOR EACH	BRANCH CIRCUIT (60°C COPPER)
EF-1	99 W	0.9	120V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT SWITCH.	1/2" – 2#12 & #12G
EF-2	99 W	0.9	120V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT SWITCH.	1/2" – 2#12 & #12G
EF-3	99 W	0.9	120V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT SWITCH.	1/2" – 2#12 & #12G
EF-4	99 W	0.9	120V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT SWITCH.	1/2" – 2#12 & #12G
EF-5	1 HP	8.8	208V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT THERMAL SWITCH.	3/4" – 2#10 & #10G
EF-6	1 HP	8.8	208V/1PHASE	CONNECT AT CEILING. PROVIDE A WALL MOUNT THERMAL SWITCH.	3/4" – 2#10 & #10G
EF-7	121 W	1.1	120V/1PHASE	CONNECT AT CEILING. SWITCH VIA VACANCY SENSOR.	1/2" – 2#12 & #12G
EF-8	128 W	1.2	120V/1PHASE	CONNECT AT CEILING. SWITCH VIA VACANCY SENSOR.	1/2" – 2#12 & #12G

EQUIPMENT CONNECTION SCHEDULE:

DESIGN	HP/KW	FLA	MCA	MOCP	VOLTAGE	DISCONNECT	BRANCH CIRCUIT (COPPER 60°)
IEWH-1	4 KW	19.2	–	25	208V/1PHASE	1) LOCKABLE CIRCUIT BREAKER.	3/4" – 2#10 & #10G
IEWH-2	4 KW	19.2	–	25	208V/1PHASE	1) LOCKABLE CIRCUIT BREAKER.	3/4" – 2#10 & #10G
IEWH-3	4 KW	19.2	–	25	208V/1PHASE	1) LOCKABLE CIRCUIT BREAKER.	3/4" – 2#10 & #10G
CF-1,2,3	3/4 HP EACH	22.8	34.2	35	208V/1PHASE	30A, 2PNF, 240V, NEMA 1 EACH.	3/4" – 2#8 & #10G

GENERAL NOTE:
LOCATE EQUIPMENT MEANS OF DISCONNECT WITHIN EQUIPMENT SIGHT. DO NOT INSTALL ON EQUIPMENT, BELOW DUCTWORK OR PLUMBING LINES.
NOTES:
1) PROVIDE LOCK SAFE CIRCUIT BREAKER PER NEC 110.25.

FEEDER SCHEDULE:

FEEDER AMPS	CONDUIT AND FEEDER	FEEDING THESE DEVICES
250	3" – 4#250KCMIL & #4G	B
400	4" – 4#600KCMIL & #3G	A
400	4" – 4#600KCMIL	DISC. A

SIZING METHOD: COPPER 75°C

LINE TYPE LEGEND	
———	DENOTES EXISTING TO REMAIN
———	DENOTES NEW

A

ROOM AUTOMOTIVE AREA — VOLTS 208Y/120V 3P 4W — AIC 10,000
MOUNTING SURFACE — BUS AMPS 400 — MAIN BKR MLO
FED FROM UTILITY — NEUTRAL 100% — LUGS STANDARD
NOTE PROVIDE A TYPE WRITTEN AS BUILD DIRECTORY THAT INCLUDES ROOM NUMBERS.

CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	B	C	CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	B	C
1	25/2	1) IEWH-1	2			2	250/3	PANEL B	40.2		
3	|			2		4	|			34	
5	25/2	1) IEWH-2			2	6	|				29.7
7	|		2			8	20/1	EF-1	0.1		
9	25/2	1) IEWH-3		2		10	20/1	EF-2		0.1	
11	|				2	12	20/1	EF-3			0.1
13	25/2	(1HP) EF-5	0.96			14	20/1	EF-4	0.1		
15	|			0.96		16	20/1	ELECTROMAGNETISM TRAINER		0.156	
17	25/2	(1HP) EF-6			0.96	18	20/1	ELECTROMAGNETISM TRAINER			0.156
19	|		0.96			20	20/1	BATTERY CHARGER	0.504		
21	35/2	CF-1, CF-2, CF-3		2.48		22	20/1	BATTERY CHARGER		0.504	
23	|				2.48	24	20/1	BATTERY CHARGER			0.504
25	50/2	MILLER WELDER	4.2			26	20/1	RECEPT.	1.08		
27	|			4.2		28	20/1	RECEPT.		0.54	
29	20/1	SPACE			0	30	20/1	ENGINE TRAINER, RECEPT.			0.72
31	20/1	SPACE	0			32	20/1	SPACE	0		
33	20/1	SPACE		0		34	20/1	SPACE		0	
35	20/1	SPACE			0	36	20/1	SPACE			0
37	20/1	SPACE	0			38	20/1	SPACE	0		
39	20/1	SPACE		0		40	20/1	SPACE		0	
41	20/1	SPACE			0	42	20/1	SPACE			0
								TOTAL CONNECTED KVA BY PHASE	52.1	46.9	38.7

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LARGEST MOTOR	2.75	0.686	(25%)	RECEPTACLES	88.2	49.1	(50%>10)
MOTORS	17.4	17.4	(100%)	NONCONTINUOUS	32	32	(100%)
				TOTAL LOAD		99.2	
				BALANCED 3-PHASE LOAD		275 A	

1) PROVIDE LOCK SAFE CIRCUIT BREAKER PER NEC 110.25.

B

ROOM AUTOMOTIVE AREA — VOLTS 208Y/120V 3P 4W — AIC 10,000
MOUNTING SURFACE — BUS AMPS 400 — MAIN BKR 250
FED FROM A — NEUTRAL 100% — LUGS STANDARD
NOTE PROVIDE A TYPE WRITTEN AS BUILD DIRECTORY THAT INCLUDES ROOM NUMBERS.

CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	B	C	CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	B	C
1	20/1	BENCH TOP GRINDER	0.504			2	30/2	ASYMMETRICAL LIFT	1.37		
3	20/1	PRESSURE WASHER		0.18		4	|			1.37	
5	20/1	DRILL PRESS			0.18	6	30/2	ASYMMETRICAL LIFT			1.37
7	20/1	COATS ALIGNMENT	1.8			8	|		1.37		
9	20/1	MULTIPLEX NETWORK TRAINER		1.8		10	30/2	ASYMMETRICAL LIFT		1.37	
11	20/1	CRC SMART WASHER			0.756	12	|				1.37
13	30/1	LTG SYSTEM TRAINER	3.6			14	20/2	ALIGNMENT RACK	1.94		
15	20/1	BRAKE WASHER		0.756		16	|			1.94	
17	20/1	BENCH TOP GRINDER			0.504	18	20/2	WHEEL BALANCER SWT			1.04
19	20/1	CHOP SAW	1.8			20	|		1.04		
21	20/1	CHOP SAW		1.8		22	30/2	ADJUSTIBLE LIFT		2.08	
23	20/1	BENCH TOP GRINDER			0.504	24	|				2.08
25	20/1	BRAKE FLUSH SYSTEM	1.8			26	30/2	ADJUSTIBLE LIFT	2.08		
27	20/1	RECEPT.		0.18		28	|			2.08	
29	20/1	RECEPT.			0.18	30	30/2	ADJUSTIBLE LIFT			2.08
31	20/1	DC CIRCUIT TRAINER	0.96			32	|		2.08		
33	20/1	DC CIRCUIT TRAINER		0.96		34	20/2	TIRE CHANGER		2.08	
35	20/1	DC CIRCUIT TRAINER			0.96	36	|				2.08
37	20/1	DC CIRCUIT TRAINER	0.96			38	20/2	WHEEL BALANCER	1.56		
39	20/1	DC CIRCUIT TRAINER		0.96		40	|			1.56	
41	20/1	DC CIRCUIT TRAINER			0.96	42	20/2	COATS TIRE CHANGER			1.56
43	20/1	BRAKE WASHER	0.756			44	|		1.56		
45	20/1	BRAKE WASHER		0.756		46	20/1	RECEPT.		0.18	
47	20/1	BRAKE WASHER			0.756	48	20/1	RECEPT.			0.18
49	20/1	BRAKE WASHER	0.756			50	20/1	BRAKE TRAINER	1.8		
51	20/1	CAR LATHE		0.696		52	20/1	BATTERY CHARGER		0.12	
53	20/1	CAR LATHE			0.696	54	20/1	BATTERY CHARGER			0.12
55	20/1	TRANSMISSION FLUID EXCHANGER	1.8			56	20/1	RECOVERY AC SERVICE	1.44		
57	20/1	COOLANT FLUID EXCHANGER		1.8		58	20/1	RECOVERY AC SERVICE		1.44	
59	20/1	POWER STEERING FLUID EXCHANGER			1.8	60	20/1	BATTERY CHARGER			0.12
61	20/1	BRAKE FLUSH SYSTEM	1.8			62	20/1	BATTERY CHARGER	0.12		
63	20/1	BRAKE FLUSH SYSTEM		1.8		64	20/1	BOMBER BRAKE LATHE		1.8	
65	20/1	BRAKE FLUSH SYSTEM			1.8	66	20/1	BRAKE LATHE			1.44
67	20/1	BRAKE FLUSH SYSTEM	1.8			68	20/1	POWER STEERING FLUID EXCHANGER	1.8		
69	20/1	SENSORS TRAINER		1.8		70	20/1	COOLANT FLUID EXCHANGER		1.8	
71	20/1	SENSORS TRAINER			1.8	72	20/1	TRANSMISSION FLUID EXCHANGER			1.8
73	20/1	SENSORS TRAINER	1.8			74	20/1	RECEPT.	0.36		
75	20/1	SENSORS TRAINER		1.8		76	20/1	SPACE		0	
77	20/1	SENSORS TRAINER			1.8	78	20/1	RECEPT.			0.36
79	20/1	DC CIRCUIT TRAINER	0.96			80	20/1	RECEPT.	0.54		
81	20/1	BATTERY CHARGER		0.12		82	20/1	RECEPT.		0.72	
83	20/1	RECOVERY AC SERVICE			1.44	84	20/1	SPACE			0
								TOTAL CONNECTED KVA BY PHASE	40.2	34	29.7

	CONN KVA	CALC KVA			CONN KVA	CALC KVA	
LARGEST MOTOR	2.75	0.686	(25%)	RECEPTACLES	75.7	42.8	(50%>10)
MOTORS	8.24	8.24	(100%)	NONCONTINUOUS	20	20	(100%)
				TOTAL LOAD		71.7	
				BALANCED 3-PHASE LOAD		199 A	

GENERAL NOTE: PROVIDE SHUNT TRIP TYPE MAIN CIRCUIT BREAKER TO BE INTERCONNECTED WITH EMERGENCY PUSHBUTTONS.

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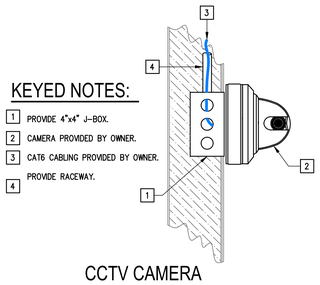
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Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: C.G.
Job No. 25c22
Sheet: E6.01

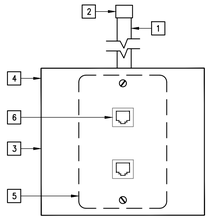


KEYED NOTES:

1. PROVIDE 4"x4" J-BOX.
2. CAMERA PROVIDED BY OWNER.
3. CAT6 CABLING PROVIDED BY OWNER. PROVIDE RACEWAY.
4.

13 CCTV CAMERA ROUGH-IN DETAIL

SCALE : NOT TO SCALE

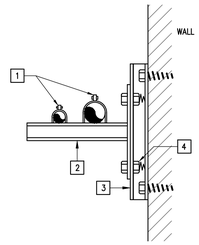


KEYED NOTES:

1. PROVIDE 1" EMT STUBBED ABOVE CLG.
2. PROVIDE INSULATING BUSHING
3. PROVIDE 4"X4"X2-5/8" DEEP BOX
4. PROVIDE COVERPLATE
5. PROVIDE STEEL MUD RING
6. CAT6 JACK AND CABLING BY OWNER.

09 TYPICAL DATA OUTLET DETAIL

SCALE : NOT TO SCALE

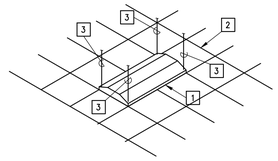


KEYED NOTES:

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.

05 RACEWAY RUNS SUPPORT DETAIL

SCALE : NOT TO SCALE

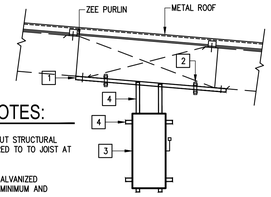


KEYED NOTES:

1. PROVIDE 2'x 4' LAY-IN LIGHT FIXTURE
2. SUSPENDED CEILING
3. PROVIDE TIE WIRE, CONNECT TO ALL FOUR CORNERS OF FIXTURE TO STRUCTURE ABOVE, INDEPENDENT OF CEILING SUPPORTS.

01 TYPICAL LAY-IN FIXTURE SUPPORT

SCALE : NOT TO SCALE

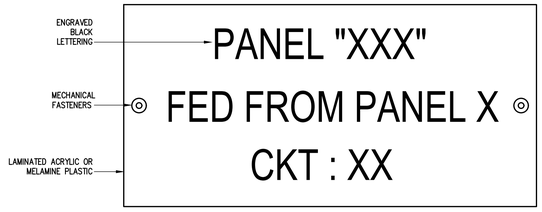


KEYED NOTES:

1. PROVIDE UNISTRUT STRUCTURAL CHANNEL SECURED TO TO JOIST AT BOTH ENDS.
2. PROVIDE 1/2" GALVANIZED THREADED ROD MINIMUM AND LOCKNUT.
3. PROVIDE DISCONNECT SWITCH SPECIFIED.
4. PROVIDE UNISTRUT STRUCTURAL CHANNEL SUPPORT.

10 CEILING FANS DISCONNECT SWITCH SUPPORT DETAIL

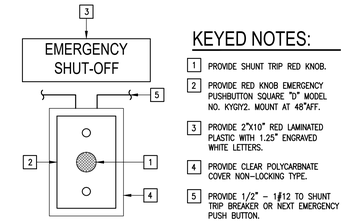
SCALE : NOT TO SCALE



NOTE: ATTACH NAMEPLATES TO ALL ELECTRICAL GEAR AS NOTED ON SECTION 260553.

06 EQUIPMENT IDENTIFICATION LABEL DETAIL

SCALE : NOT TO SCALE

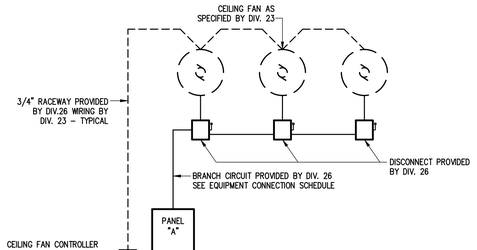


KEYED NOTES:

1. PROVIDE SHUNT TRIP RED KNOB.
2. PROVIDE RED KNOB EMERGENCY PUSHBUTTON SQUARE "D" MODEL NO. KYGY2. MOUNT AT 48"AFF.
3. PROVIDE 2"X10" RED LAMINATED PLASTIC WITH 1.25" ENGRAVED WHITE LETTERS.
4. PROVIDE CLEAR POLYCARBINATE COVER NON-LOCKING TYPE.
5. PROVIDE 1/2" - 1#12 TO SHUNT TRIP BREAKER OR NEXT EMERGENCY PUSH BUTTON.

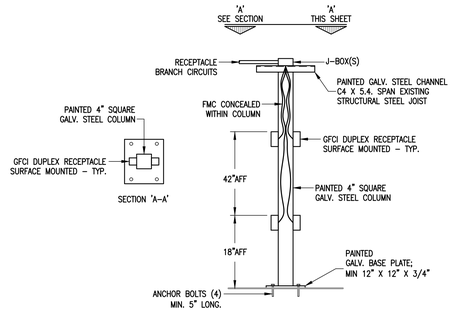
02 EMERGENCY PUSH BUTTON DETAIL

SCALE : NOT TO SCALE



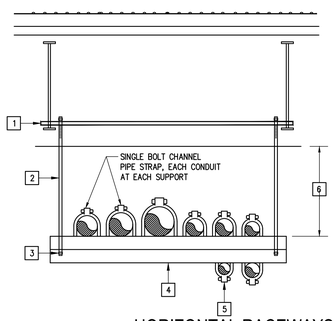
11 CEILING FANS WIRING DETAIL

SCALE : NOT TO SCALE



07 PIPE SUPPORT STRUCTURE DETAIL

SCALE : NOT TO SCALE



KEYED NOTES:

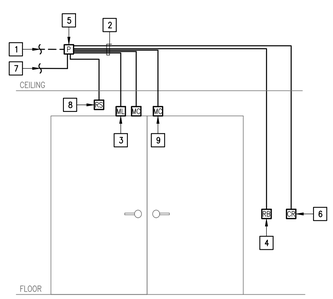
1. PROVIDE UNISTRUT STRUCTURAL CHANNEL SECURED TO TO JOIST AT BOTH ENDS.
2. PROVIDE 1/2" GALVANIZED ROD MINIMUM.
3. PROVIDE LOCKNUT.
4. PROVIDE GALVANIZED UNISTRUT 8'-0" O/C MAXIMUM.
5. PROVIDE 0"-1" MAXIMUM SIZE ON BOTTOM OF UNISTRUT.
6. VARIES.

03 HORIZONTAL RACEWAYS SUPPORT DETAIL

SCALE : NOT TO SCALE

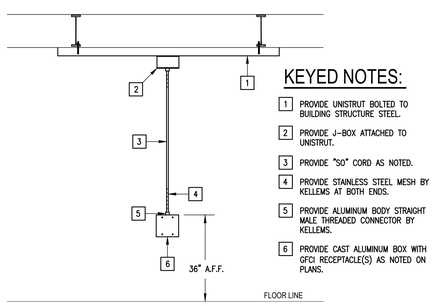
DOOR ACCESS SYSTEM KEYED NOTES:

1. PROVIDE 120V CONNECTION FROM PANEL "A".
2. PROVIDE 3/4" RACEWAY. LOW VOLTAGE WIRING PROVIDED BY OWNER.
3. PROVIDE MAGNETIC LOCK.
4. PROVIDE BACK BOX FOR RELEASE BUTTON.
5. POWER SUPPLY PROVIDED BY OWNER.
6. PROVIDE BACK BOX FOR CARD READER.
7. CAT6 CABLE PROVIDED BY OWNER.
8. PROVIDE BACK BOX FOR RELEASE SENSOR 24" ABOVE DOOR.
9. MAGNETIC CONTACT PROVIDED BY OWNER.



12 DOOR ACCESS ROUGH-IN DETAIL

SCALE : NOT TO SCALE

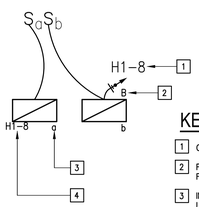


KEYED NOTES:

1. PROVIDE UNISTRUT BOLTED TO BUILDING STRUCTURE STEEL.
2. PROVIDE J-BOX ATTACHED TO UNISTRUT.
3. PROVIDE "SO" CORD AS NOTED.
4. PROVIDE STAINLESS STEEL MESH BY KELLEMS AT BOTH ENDS.
5. PROVIDE ALUMINUM BODY STRAIGHT MALE THREADED CONNECTOR BY KELLEMS.
6. PROVIDE CAST ALUMINUM BOX WITH GFCI RECEPTACLE(S) AS NOTED ON PLANS.

08 PENDANT MOUNTED RECEPTACLE DETAIL

SCALE : NONE



KEYED NOTES:

1. CIRCUIT HOMERUN
2. FIXTURE TYPE - REFER TO LIGHT FIXTURE SCHEDULE
3. INDICATES SWITCH CONTROLLING LIGHT FIXTURE.
4. INDICATES BRANCH CIRCUIT LIGHT FIXTURE IS CONNECTED TO

04 LIGHTING LEGEND DETAIL

SCALE : NOT TO SCALE

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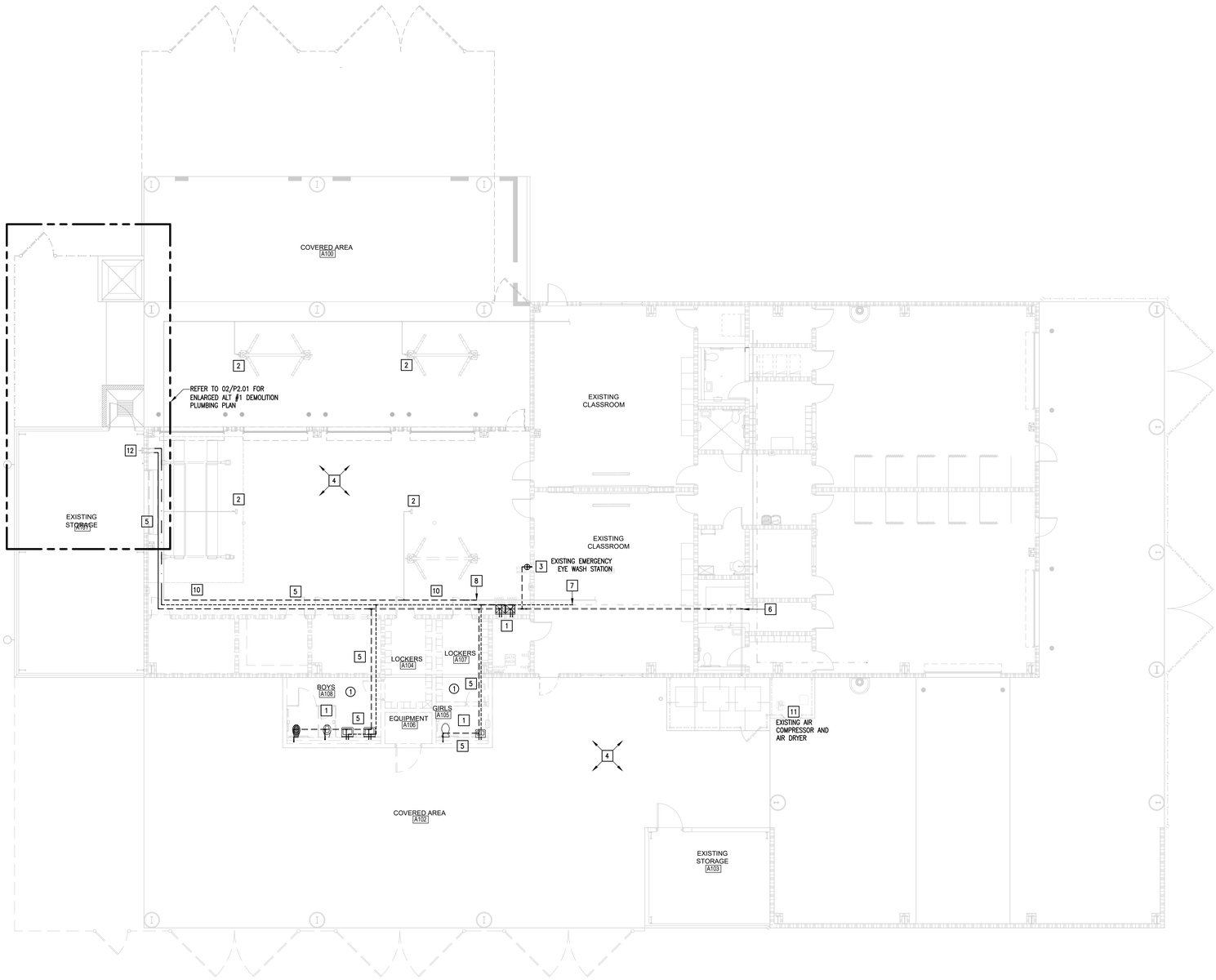
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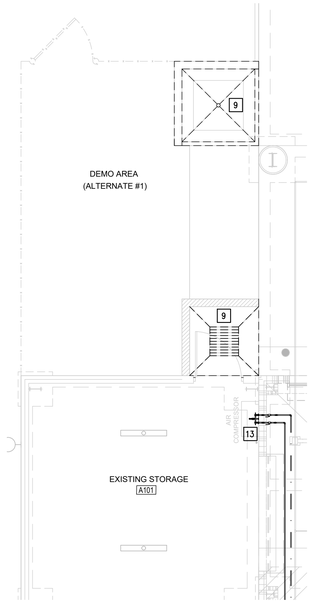
Date:	03/21/2025
Scale:	As Noted
Project Architect:	David Monreal, AIA
Drawn By:	C.G.
Job No.	25v22
Sheet:	E7.01



EXISTING / DEMOLITION PLUMBING FLOOR PLAN

SCALE : 1/8" = 1'-0"

PLAN NORTH



ALT #1 DEMOLITION PLUMBING FLOOR PLAN

SCALE : 3/16" = 1'-0"

PLAN NORTH

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, STRUCTURAL SUPPORTS MATERIALS AND MISCELLANEOUS ITEMS. ALL SUCH 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.
10. PLUMBING CONTRACTOR TO LOCATE EXISTING MAIN DOMESTIC COLD AND HOT WATER SHUT-OFF VALVES, CLOSE AND PURGE LINES BEFORE PERFORMING ANY WORK ON EXISTING PLUMBING SYSTEMS.

DEMOLITION PLUMBING KEYED NOTES:

1. DEMOLISH EXISTING PLUMBING FIXTURES.
2. EXISTING HOSE REEL TO REMAIN.
3. REMOVE AND STORE EXISTING EMERGENCY EYE WASHER TO BE REUSED. REFER TO 01/P3.01 AND 01/P4.01 FOR NEW LOCATION.
4. PREPARE AREA FOR INSTALLATION OF NEW PLUMBING FIXTURES, REFER TO NEW PLUMBING PLANS FOR NEW WORK. COORDINATE WITH DEMOLITION.
5. DEMOLISH EXISTING DOMESTIC HOT AND COLD WATER LINES LOCATED IN CHASE CAVITY AND ABOVE CEILING AS SHOWN ON PLANS. COORDINATE WITH ARCHITECTURAL DEMOLITION WORK. REPAIR WALL TO MATCH EXISTING CONDITIONS.
6. DISCONNECT EXISTING 1-1/2" COLD WATER PIPING AT THIS APPROXIMATE LOCATION TO CONNECT NEW COLD WATER PIPING. REFER TO 01/P3.01 FOR CONTINUATION. FIELD VERIFY EXACT LOCATION.
7. DISCONNECT AND CAP EXISTING 3/4" HOT WATER PIPING AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXACT LOCATION.
8. DISCONNECT EXISTING 1" COMPRESSED AIR PIPING AT THIS APPROXIMATE LOCATION TO CONNECT NEW COMPRESSED AIR PIPING. REFER TO 01/P3.01 FOR CONTINUATION. FIELD VERIFY EXACT LOCATION.
9. ALT. #1 CAP AND ABANDON IN PLACE EXISTING TRENCH DRAIN, REPAIR CONCRETE SLAB AND MATCH EXISTING CONDITIONS. ABANDON IN PLACE WASTE PIPING.
10. DEMOLISH EXISTING COMPRESSED AIR PIPING AS SHOWN ON PLANS.
11. EXISTING AIR COMPRESSOR AND AIR DRYER TO REMAIN.
12. EXISTING WALL HYDRANT TO REMAIN, DISCONNECT COLD AND HOT WATER SUPPLY AS SHOWN ON PLANS.
13. ALT. #1 DEMOLISH EXISTING WALL HYDRANT AND DISCONNECT HOT AND COLD WATER PIPING AS SHOWN PLANS, CAP AND ABANDON PIPE IN WALL CAVITY, AND REPAIR WALL TO MATCH EXISTING CONDITIONS.

GENERAL CONST. KEYED NOTES:

1. REFER TO ARCHITECTURAL PLANS FOR REMOVAL AND REPLACEMENT OF ARCHITECTURAL FEATURES.

PLUMBING LEGEND

	EXISTING COLD WATER PIPING TO REMAIN
	EXISTING HOT WATER PIPING TO REMAIN
	EXISTING COMPRESSED AIR PIPING TO REMAIN
	EXISTING COLD WATER PIPING TO BE DEMOLISHED
	EXISTING HOT WATER PIPING TO BE DEMOLISHED
	EXISTING COMPRESSED AIR PIPING TO BE DEMOLISHED
	TO BE DEMOLISHED
	EXISTING WALL
	PLUMBING FIXTURE TO BE DEMOLISHED

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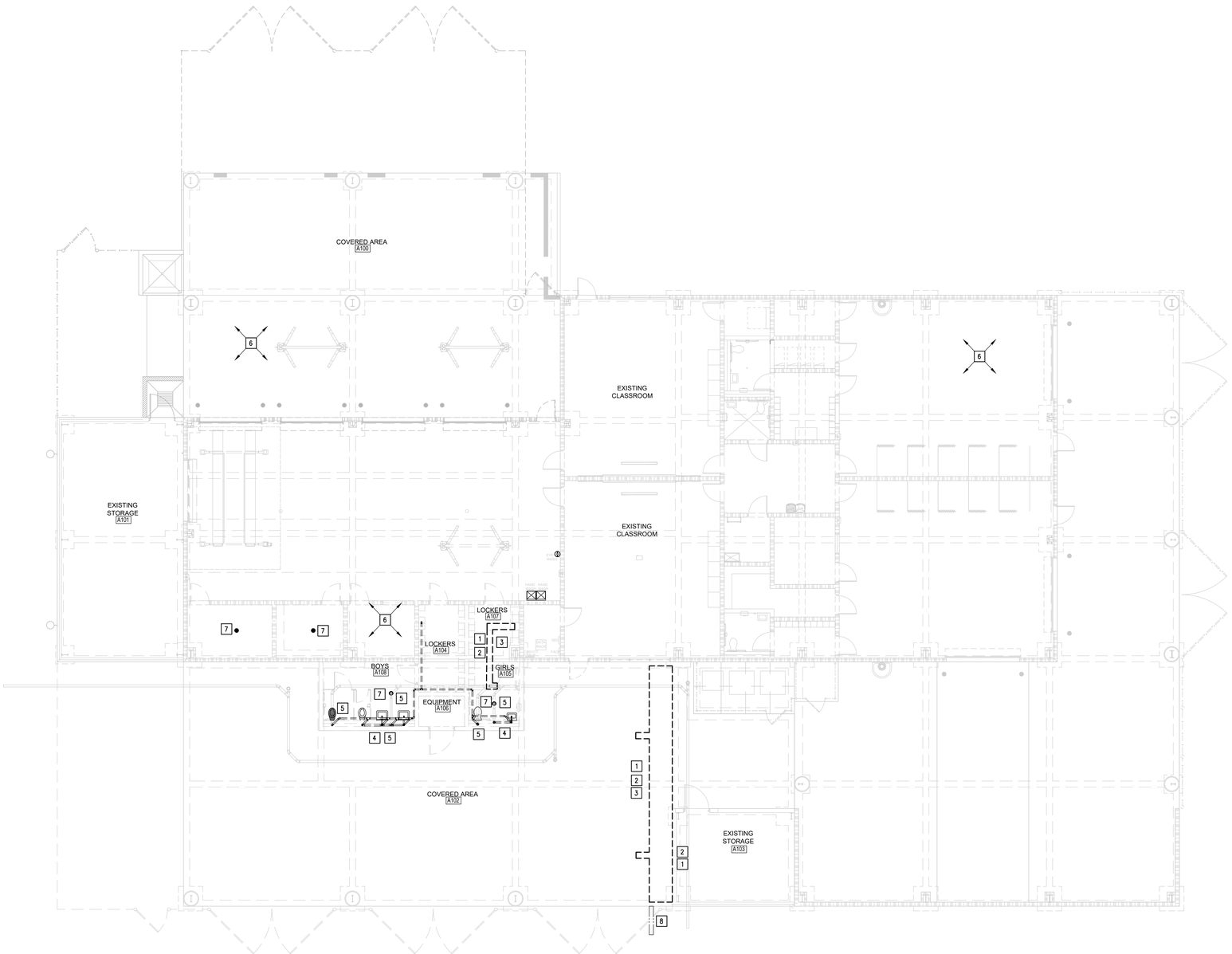
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EXISTING / DEMOLITION WASTE AND VENT FLOOR PLAN

01 SCALE : 1/8" = 1'-0"

PLAN NORTH

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, STRUCTURAL SUPPORTS MATERIALS AND MISCELLANEOUS ITEMS. ALL SUCH 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.
10. PERFORM CONCRETE SLAB SAW CUTTING AS NECESSARY TO ACCOMMODATE NEW PLUMBING FIXTURES. COORDINATE SAW CUTTING WITH GENERAL CONTRACTOR. CONTRACTOR SHALL NOT PROCEED WITH CONCRETE SLAB SAW CUTTING WITHOUT THE EXPRESSED WRITTEN CONSENT OF THE ARCHITECT AND STRUCTURAL ENGINEER.

DEMOLITION PLUMBING KEYED NOTES:

1. PERFORM FLOOR TILE AND CONCRETE SLAB SAW CUTTING AND REPAIR AS NECESSARY TO ACCOMMODATE NEW PLUMBING FIXTURES. COORDINATE WITH DEMOLITION WORK.
2. REPAIR FLOOR TILE AND CONCRETE SLAB SAW CUTTING AREA. MATCH ARCHITECTURAL FINISH. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS AND COORDINATE WITH ARCHITECT FOR REPAIRING.
3. PREPARE AREA FOR INSTALLATION OF NEW PLUMBING FIXTURES, REFER TO NEW PLUMBING PLANS FOR NEW WORK. COORDINATE WITH DEMOLITION.
4. DEMOLISH EXISTING SANITARY SEWER AND VENT LINES LOCATED IN CHASE/ WALL CAVITY AND ABOVE CEILING. COORDINATE WITH ARCHITECTURAL DEMOLITION WORK. RETAIN ROOF PENETRATIONS TO BE REUSED FOR NEW VENT PIPING.
5. CAP EXISTING SANITARY SEWER AT FINISHED FLOOR. REPAIR FLOOR TILE IN AREA TO MATCH ARCHITECTURAL FINISH, ABANDON IN PLACE EXISTING SANITARY SEWER PIPE.
6. APPROXIMATE LOCATION OF EXISTING STRUCTURAL FOUNDATION SHOWN FOR REFERENCE AND COORDINATION PURPOSES. REFER TO STRUCTURAL DRAWINGS FOR BEAM PENETRATIONS DETAILS. FIELD VERIFY EXACT LOCATION.
7. EXISTING FLOOR DRAIN TO BE DEMOLISHED AT THIS APPROXIMATE LOCATION. CAP AND ABANDON IN PLACE EXISTING SANITARY SEWER.
8. EXCAVATE AT THIS APPROXIMATE LOCATION TO INSTALL NEW UNDERGROUND SANITARY SEWER PIPING. HAND DIG AS NECESSARY TO AVOID ANY EXISTING UTILITIES. AREA TO BE BACKFILLED AND COMPACTED TO MATCH EXISTING CONDITIONS.

PLUMBING LEGEND

	EXISTING SANITARY SEWER PIPING TO REMAIN
	EXISTING VENT PIPING TO REMAIN
	EXISTING SANITARY SEWER PIPING TO BE DEMOLISHED
	EXISTING VENT PIPING TO BE DEMOLISHED
	TO BE DEMOLISHED
	SAW CUTTING
	EXISTING WALL
	PLUMBING FIXTURE TO BE DEMOLISHED
	HAND DIG

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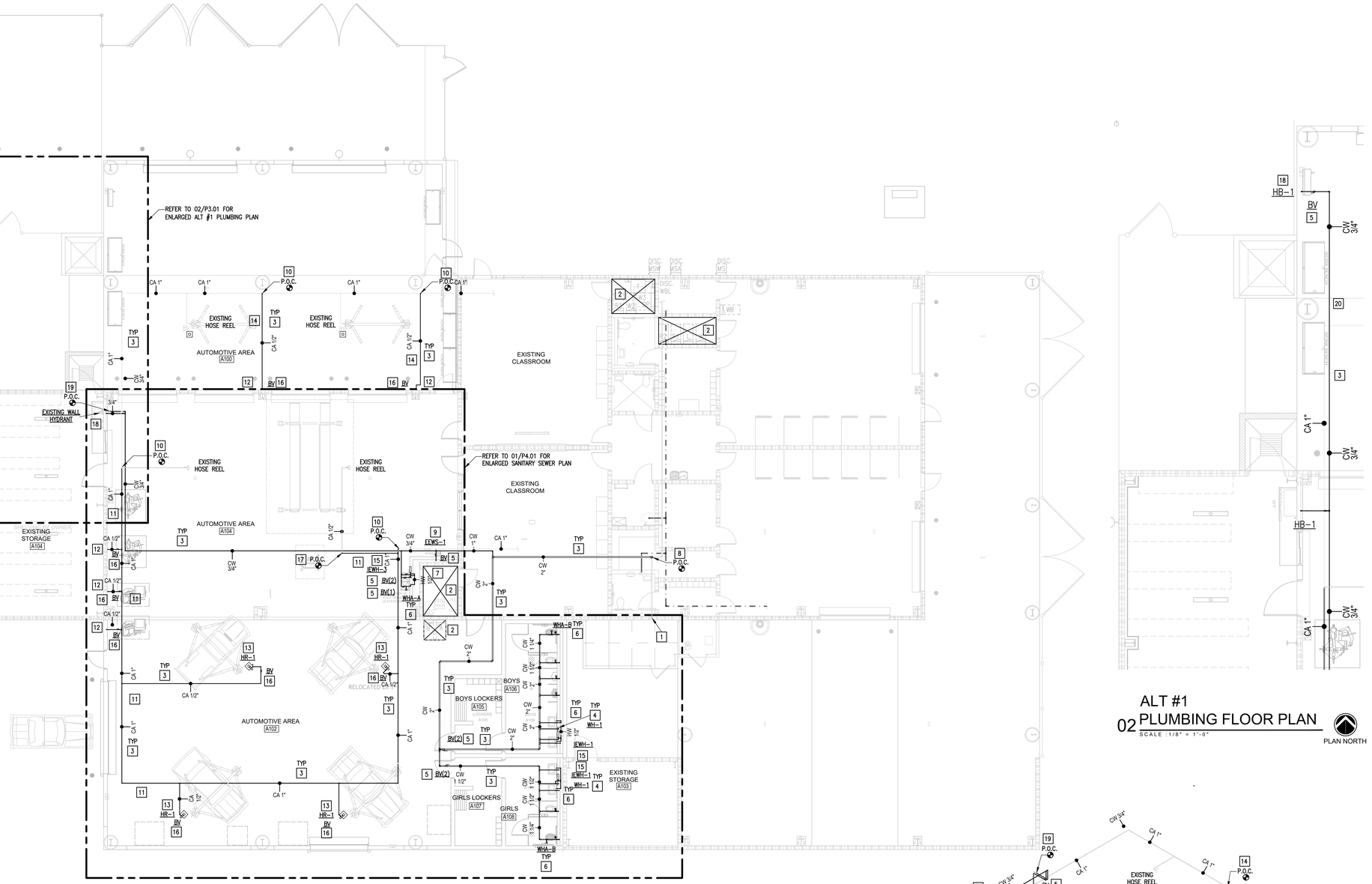
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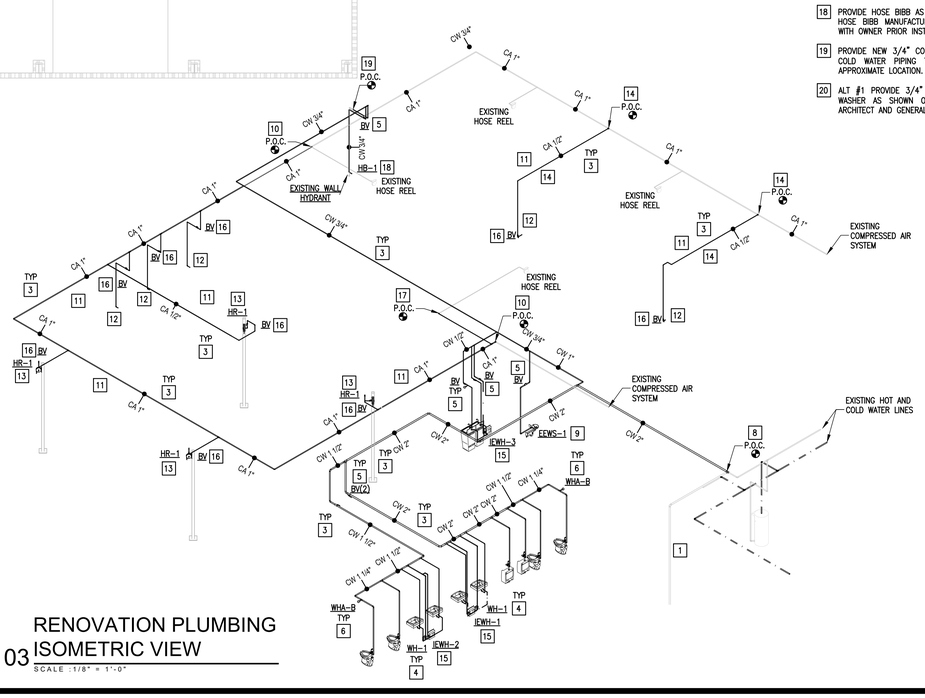
01 RENOVATION PLUMBING FLOOR PLAN
SCALE : 1/8" = 1'-0"

PLAN NORTH

ALT #1
02 PLUMBING FLOOR PLAN
SCALE : 1/8" = 1'-0"

PLAN NORTH

PLUMBING LEGEND	
	EXISTING COLD WATER PIPING TO REMAIN
	EXISTING HOT WATER PIPING TO REMAIN
	NEW COLD WATER PIPING (CW)
	NEW HOT WATER PIPING (HW)
	EXISTING COMPRESSED AIR PIPE TO REMAIN
	NEW COMPRESSED AIR PIPING (CA)



03 RENOVATION PLUMBING ISOMETRIC VIEW
SCALE : 1/8" = 1'-0"

GENERAL NOTES:

1. FOR ALL ISOLATION VALVES LOCATED ABOVE A SUSPENDED CEILING, CONTRACTOR IS TO PROVIDE A MARKER ON CEILING GRID WHICH CLEARLY INDICATES "WATER VALVE" AND WHICH CEILING TILE IS TO BE REMOVED TO ACCESS THE VALVE. THE MARKER IS TO BE ROUND DOT OF HEAVY DUTY COLORED PAPER WITH WATER FLOW DIRECTION INDICATION AND ADHESIVE BACKING. OBTAIN OWNER APPROVAL FOR COLOR, SIZE AND TYPE PRIOR TO INSTALLATION.
2. NOT ALL ACCESSORIES REQUIRED FOR INSTALLATION ARE SHOWN ON DRAWINGS FOR CLARITY. SEE ASSOCIATED DETAILS ON THE DETAILS SHEET FOR INSTALLATION AND SPECIFICATIONS.
3. ALL POINTS OF CONNECTION OF EQUIPMENT SHOWN ON PLANS ARE SCHEMATIC IN NATURE. ISOMETRIC VIEWS PROVIDE A GENERAL IDEA OF WHERE THESE POINTS OF CONNECTION COULD BE. CONTRACTOR SHALL VERIFY EXACT LOCATION OF POINTS OF CONNECTION WITH EQUIPMENT CUTSHEETS DURING SUBMITTAL PROCESS AND INSTALLATION ACTIVITIES.
4. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING A FULLY OPERATIONAL SYSTEM FOR NEW PLUMBING FIXTURES, INCLUDING SANITARY SEWER AND DOMESTIC WATER SUPPLY LINES.
5. CONTRACTOR SHALL ENSURE THAT ANY EXISTING PLUMBING FIXTURES DESIGNATED TO REMAIN ARE FULLY FUNCTIONAL AND PROPERLY CONNECTED TO THE SANITARY SEWER, DOMESTIC COLD WATER AND COMPRESSED AIR SYSTEMS.

PLUMBING KEYED NOTES:

1. EXISTING 2" DOMESTIC COLD WATER PIPING AT THIS APPROXIMATE LOCATION.
2. CLEARANCE FOR ELECTRICAL PANELS. ROUTE NO PIPING OVER THIS AREA. REFER TO ELECTRICAL PLANS FOR EXACT LOCATION OF ELECTRICAL ROOMS.
3. PROVIDE PIPING SUPPORT AS PER SPECS AND DETAIL. SEE ASSOCIATED DETAIL ON DETAIL SHEET. (TYPICAL)
4. PROVIDE WALL HYDRANT AS SCHEDULED. PROVIDE CLOSE COUPLED HYDRANT TO ENSURE PIPE TURNS UP INSIDE BLOCK WALL. COORDINATE WALL THICKNESS WITH WALL HYDRANT MANUFACTURER DATA. (TYPICAL)
5. PROVIDE BRONZE ISOLATION BALL VALVE ABOVE CEILING OR BEHIND WALL. PROVIDE 12"X12" ACCESS PANEL WHERE INSTALLED IN AN INACCESSIBLE AREA. ACCESS PANEL EQUAL TO ACUDOR MODEL UF5000 WITH CYLINDER LOCK AND KEY AND PAINT TO MATCH THE WALL/CEILING. PROVIDE VALVE IDENTIFICATION TAGS AS PER SPECIFICATIONS. (TYPICAL)
6. PROVIDE BELLOWS TYPE WATER HAMMER ARRESTOR (WHA), MIFAB OR APPROVED EQUAL INDICATED MODEL (A,B,C,D,E,F) AS PER MIFAB SIZING CHART. PROVIDE 12"X12" ACCESS PANEL WHERE INSTALLED IN AN INACCESSIBLE AREA. ACCESS PANEL EQUAL TO ACUDOR MODEL UF5000 WITH CYLINDER LOCK AND KEY AND PAINT TO MATCH THE WALL/CEILING. (TYPICAL)
7. SLEEVE ALL GRADE BEAM, FLOOR SLAB AND MASONRY WALL PENETRATIONS PER DETAIL WHETHER SPECIFICALLY INDICATED ON PLANS OR NOT.
8. PROVIDE NEW 2" COLD WATER PIPE AND CONNECT INTO EXISTING 2" COLD WATER LINE AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR COMMENCING WORK.
9. INSTALL EXISTING EMERGENCY EYE WASH STATION (EEWS-1) AT THIS APPROXIMATE LOCATION.
10. PROVIDE NEW 1" COMPRESSED AIR PIPE AND CONNECT INTO EXISTING 1" COMPRESSED AIR LINE AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR COMMENCING WORK.
11. PROVIDE COMPRESSED AIR PIPING AS PER SPECIFICATIONS AND DROP AT DESIGNATED SYSTEM AIR OUTLETS. PROVIDE ANCHORS, BUILDING ATTACHMENTS AND PIPE SUPPORTS AS PER SPECIFICATIONS.
12. PROVIDE AIR TERMINATIONS OUTLETS ATTACHED TO STRUCTURAL MEMBERS AT THIS APPROXIMATE LOCATION. SEE DETAIL ON THE DETAIL SHEET. PRIOR TO INSTALLATION PROVIDE SHOP DRAWINGS THAT INCLUDE AIR TERMINATION OUTLET DETAILS FOR COORDINATION WITH OWNER PROVIDE HOSE REELS AND EQUIPMENT CONNECTIONS. SEE ASSOCIATED DETAIL ON DETAILS SHEET.
13. PROVIDE LOW- PRESSURE (150 PSI MAX.) AUTO RETRACTABLE AIR HOSE REEL. TO BE SUPPLIED AND INSTALLED BY PLUMBING CONTRACTOR. EQUAL TO REELCRAFT MODEL NO. A5850 OLP1. WITH 50 FT. LONG HOSE, 1/2" ID HOSE. COORDINATE MOUNTING HEIGHT AND EXACT LOCATION WITH GENERAL AND ELECTRICAL CONTRACTOR.
14. PROVIDE NEW 1/2" COMPRESSED AIR PIPE AND CONNECT INTO EXISTING 1" COMPRESSED AIR LINE AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR COMMENCING WORK.
15. PROVIDE INSTANTANEOUS ELECTRIC WATER HEATER AS SCHEDULED.
16. PROVIDE SHUTOFF VALVES IN EACH BRANCH USING BALL VALVES FOR AIR AS PER SPECIFICATIONS.
17. PROVIDE NEW 1/2" COMPRESSED AIR PIPE AND CONNECT INTO EXISTING 1/2" COMPRESSED AIR LINE AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR COMMENCING WORK.
18. PROVIDE HOSE BIBB AS SCHEDULED. COORDINATE WALL THICKNESS WITH HOSE BIBB MANUFACTURER DATA, AND COORDINATE MOUNTING HEIGHT WITH OWNER PRIOR INSTALLATION – TYPICAL.
19. PROVIDE NEW 3/4" COLD WATER PIPING AND CONNECT INTO EXISTING COLD WATER PIPING TO SERVE EXISTING WALL HYDRANT AT THIS APPROXIMATE LOCATION.
20. ALT #1 PROVIDE 3/4" COLD WATER TO SERVE RELOCATED PRESSURE WASHER AS SHOWN ON PLANS. COORDINATE EXACT LOCATION WITH ARCHITECT AND GENERAL CONTRACTOR.

No.	REVISIONS	BY

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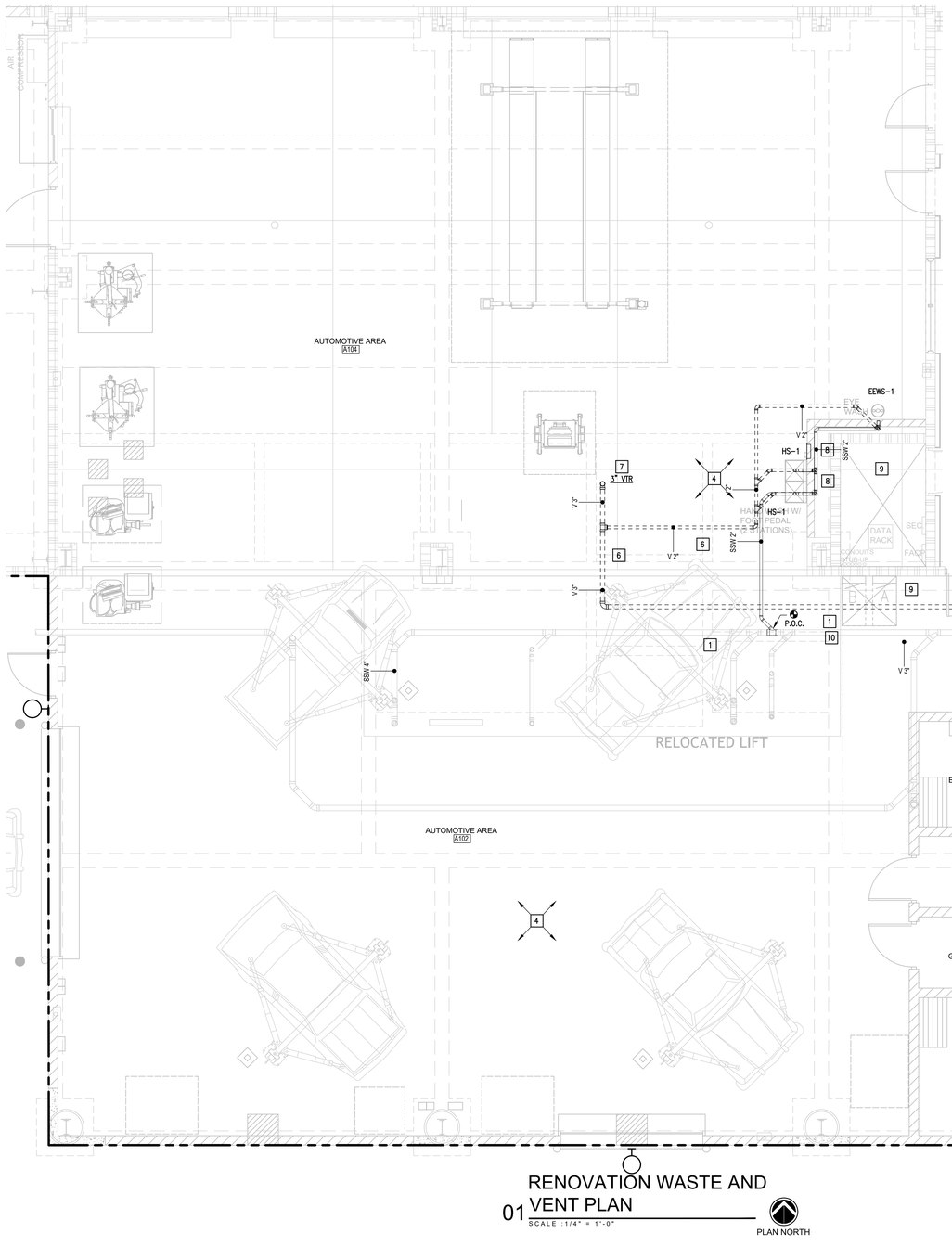
MERCEDES , TEXAS

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3.21.2025

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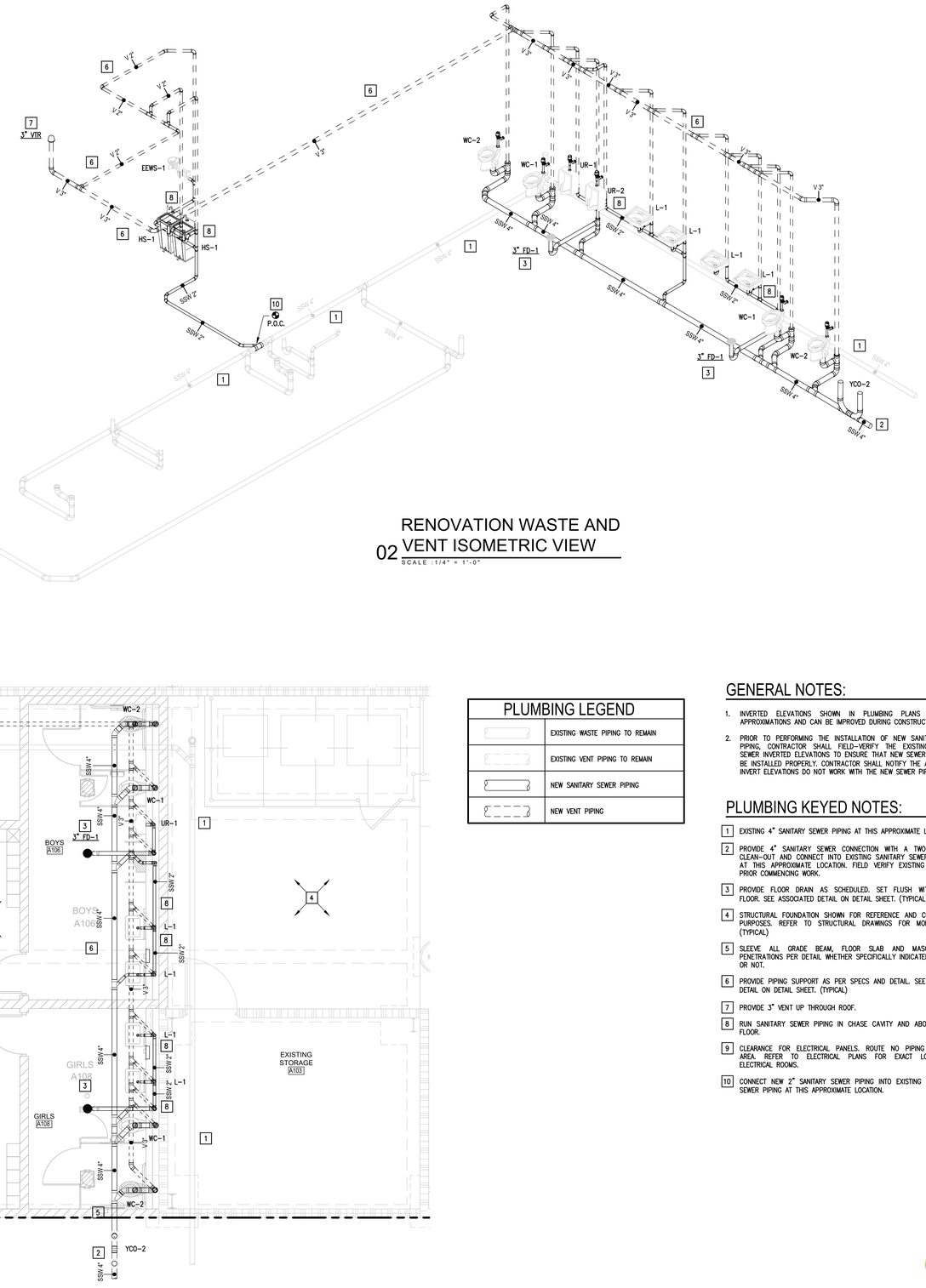
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PLAN NORTH

01 RENOVATION WASTE AND VENT PLAN

SCALE : 1/4" = 1'-0"



02 RENOVATION WASTE AND VENT ISOMETRIC VIEW

SCALE : 1/4" = 1'-0"

PLUMBING LEGEND	
	EXISTING WASTE PIPING TO REMAIN
	EXISTING VENT PIPING TO REMAIN
	NEW SANITARY SEWER PIPING
	NEW VENT PIPING

GENERAL NOTES:

1. INVERTED ELEVATIONS SHOWN IN PLUMBING PLANS ARE BEST APPROXIMATIONS AND CAN BE IMPROVED DURING CONSTRUCTION.
2. 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.

PLUMBING KEYED NOTES:

1. EXISTING 4" SANITARY SEWER PIPING AT THIS APPROXIMATE LOCATION.
2. PROVIDE 4" SANITARY SEWER CONNECTION WITH A TWO-WAY YARD CLEAN-OUT AND CONNECT INTO EXISTING SANITARY SEWER MAIN LINE AT THIS APPROXIMATE LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR COMMENCING WORK.
3. PROVIDE FLOOR DRAIN AS SCHEDULED. SET FLUSH WITH FINISHED FLOOR. SEE ASSOCIATED DETAIL ON DETAIL SHEET. (TYPICAL)
4. STRUCTURAL FOUNDATION SHOWN FOR REFERENCE AND COORDINATION PURPOSES. REFER TO STRUCTURAL DRAWINGS FOR MORE DETAILS. (TYPICAL)
5. SLEEVE ALL GRADE BEAM, FLOOR SLAB AND MASONRY WALL PENETRATIONS PER DETAIL WHETHER SPECIFICALLY INDICATED ON PLANS OR NOT.
6. PROVIDE PIPING SUPPORT AS PER SPECS AND DETAIL. SEE ASSOCIATED DETAIL ON DETAIL SHEET. (TYPICAL)
7. PROVIDE 3" VENT UP THROUGH ROOF.
8. RUN SANITARY SEWER PIPING IN CHASE CAVITY AND ABOVE FINISHED FLOOR.
9. CLEARANCE FOR ELECTRICAL PANELS. ROUTE NO PIPING OVER THIS AREA. REFER TO ELECTRICAL PLANS FOR EXACT LOCATION OF ELECTRICAL ROOMS.
10. CONNECT NEW 2" SANITARY SEWER PIPING INTO EXISTING 4" SANITARY SEWER PIPING AT THIS APPROXIMATE LOCATION.

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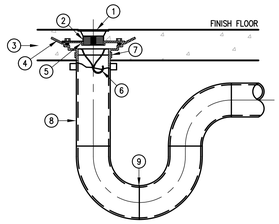
MERCEDES , TEXAS

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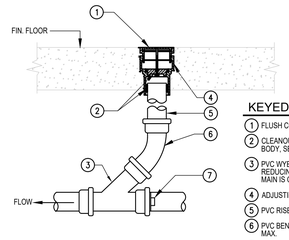


KEYED NOTES

1. N.S. STRAINER.
2. ADJUSTABLE DRAIN HEAD.
3. CONCRETE.
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.

01 FD-1 FLOOR DRAIN WITH TRAP GUARD DETAIL

SCALE: NOT TO SCALE

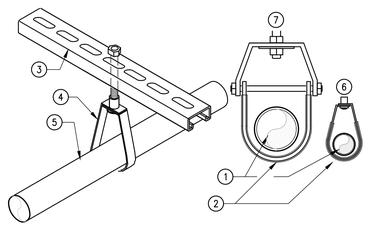


KEYED NOTES

1. FLUSH COVER
2. CLEANOUT PLUG AND BODY. SEE SPECS.
3. PVC WYE (WYE WITH REDUCING BRANCH IF MAIN IS OVER 4").
4. ADJUSTING COLLAR
5. PVC RISER
6. PVC BEND FULL SIZE, 4" MAX.
7. PLUG IF END OF LINE

02 FLOOR CLEANOUT DETAIL

SCALE: NOT TO SCALE



KEYED NOTES

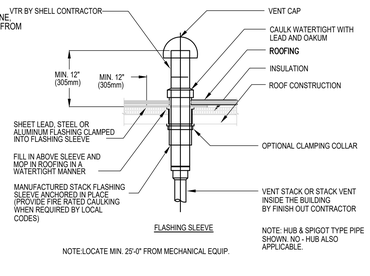
1. SCHEDULED PIPE.
2. PLASTIC COATING.
3. UNI-STRUT.
4. PIPE HANGER.
5. DOMESTIC WATER LINE, COPPER DRAIN LINE FROM AHU'S.
6. BAND HANGER.
7. CLEVIS HANGER.

NOTES:

1. PROVIDE PLASTIC COATED HANGERS: COOPER B-LINE OR APPROVED EQUAL.
2. MODEL: B3100C OR APPROVED EQUAL FOR CLEVIS.
3. HANGERS. MODEL: B3172C OR APPROVED EQUAL FOR BAND HANGERS.

03 DOMESTIC WATER LINE PIPING SUPPORT DETAIL

SCALE: NOT TO SCALE



NOTE: HUB & SPIGOT TYPE PIPE SHOWN. NO - HUB ALSO APPLICABLE.

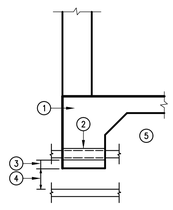
NOTE:LOCATE MIN. 25'-0" FROM MECHANICAL EQUIP.

04 VENT THRU ROOF DETAIL

SCALE: NOT TO SCALE

KEYED NOTES

1. GRADE BEAM.
2. GALV. SCH.40 STEEL SLEEVE. SIZE PER SPECS. CENTER PIPE IN SLEEVE.
3. PIPING PASSING HORIZ. THROUGH GRADE BEAM SHALL BE LOCATED NO LESS THAN 6" ABOVE BOTTOM OF BEAM.
4. PIPING PASSING HORIZ. UNDER GRADE BEAM SHALL BE LOCATED A MINIMUM OF 6" BELOW BEAM. PROVIDE A SLEEVE.
5. COORDINATE LOCATIONS OF PIPING IN 3,4,5, ABOVE AS RELIEVING ARCHES OR ADDITIONAL CONCRETE MAY BE REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY OF BEAM.

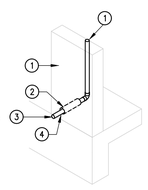


05 GRADE BEAM SLEEVE DETAIL

SCALE: NOT TO SCALE

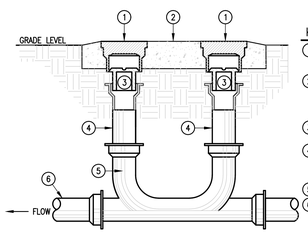
KEYED NOTES

1. MASONRY WALL.
2. GALVANIZED SCH.40 STEEL OR COPPER SLEEVE. SIZE TO BE MINIMUM TWO PIPE SIZES GREATER THAN PIPE AND INSULATION.
3. PLUMBING PIPE (RELIEF LINES DOMESTIC WATER, AIR, AND GAS PIPING.)
4. FILL VOID WITH MINERAL WOOL AND CAULK VERMIN TIGHT.



06 WALL SLEEVE DETAIL

SCALE: NOT TO SCALE

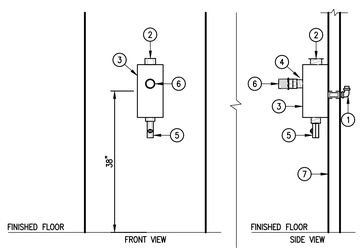


KEYED NOTES

1. PROVIDE "HEAVY DUTY" NICKLE BRONZE COVER FOR ALL EXTERIOR CLEANOUTS.
2. 45"X24"X8" DEEP CONCRETE CLEANOUT BOX (BOX IS INDEPENDANT OF PIPE AND THEREFORE IS FREE TO MOVE WITH THE SETTLEMENT OF GRADE)
3. CLEANOUT FITTING ZURN ZN-1400-4 (SEE SPECS).
4. SAME SIZE AS LINE SERVED EXCEPT 4" MAXIMUM REQUIRED. SHORT LENGTH OF C.I. PIPE FURNISHED WITH CLEANOUT BOX.
5. DOUBLE 2-WAY CLEANOUT.
6. SEWER LINE.

07 2-WAY YARD CLEANOUT DETAIL

SCALE: NOT TO SCALE

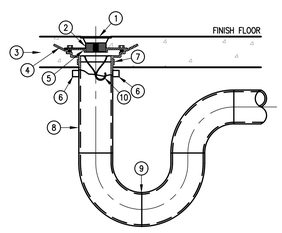


KEYED NOTES

1. 1/2" FEMALE NPT PIPE ELBOW - RAPID AIR PART No.50607
2. 1/2" BRASS PLUG - RAPID AIR PART No.50136
3. ALUMINUM BLOCK - RAPID AIR PART No.M61010
4. BRASS HEX REDUCING BUSHING FROM 1/2" TO 3/8"
5. DRAIN VALVE - RAPID AIR PART No.50120.
6. 3/8" QUICK CONNECT
7. METAL STUD WALL

08 COMPRESSED AIR TERMINATION OUTLET DETAIL

SCALE: NOT TO SCALE



KEYED NOTES

1. N.S. STRAINER.
2. ADJUSTABLE DRAIN HEAD.
3. CONCRETE.
4. MEMBRANE.
5. FLASHING COLLAR.
6. TRAP PRIMER FITTING PROVISION.
7. S.S. "NO-HUB" ASSEMBLY.
8. PIPE SIZE AS INDICATED ON PLAN.
9. DEEP SEAL P-TRAP.
10. PROVIDE PROSET TRAP GUARD OR APPROVED EQUAL.

09 FD-1 FLOOR DRAIN WITH TRAP GUARD DETAIL

SCALE: NOT TO SCALE

PLUMBING FIXTURE SCHEDULE

Project: STISD Vocational Building Renovation

MARK	MANUFACTURER & MODEL NUMBER	DESCRIPTION	CONNECTIONS WASTE	VENT	CW	HW	NOTES	REMARKS
WC-1	KOHLER K-96059-0 LUSTRA SEAT K-4670-C-0 SEAT (1" THICK) SLOAN ROYAL #8111-1.28	13-5/8" FLOOR MOUNTED, ELONGATED BOWL, HIGH EFFICIENCY, LOW CONSUMPTION FLUSH VALVE, WHITE VITREOUS CHINA WATER CLOSET WITH SIPHON JET ACTION BOWL. 1.28 GPF BATTERY POWERED TOUCHLESS FLUSHOMETER WITH TOP PUSH BOTTON, WHITE OPEN FRONT TOILET SEAT LESS COVER AND BOLT CAPS. ADULT STANDARD MOUNTING.	4"	2"	1"	-	3,4	15" TO TOP OF SEAT
WC-2	KOHLER K-96057-0 LUSTRA SEAT K-4670-C-0 SEAT (1" THICK) SLOAN ROYAL #8111-1.28	16-5/8" FLOOR MOUNTED, ELONGATED BOWL, HIGH EFFICIENCY, LOW CONSUMPTION FLUSH VALVE, WHITE VITREOUS CHINA WATER CLOSET WITH SIPHON JET ACTION BOWL. 1.28 GPF BATTERY POWERED TOUCHLESS FLUSHOMETER WITH TOP PUSH BOTTON, WHITE OPEN FRONT TOILET SEAT LESS COVER AND BOLT CAPS. ADULT ADA MOUNTING.	4"	2"	1"	-	3,4	17-5/8" TO TOP OF SEAT
UR-1	KOHLER K-4991-ET-0 SLOAN ROYAL #8186-0.5 CARRIER ZURN #Z1222	WALL MOUNTED, ELONGATED 14" RIM FROM FINISHED WALL. ULTRA HIGH EFFICIENCY, BATTERY POWERED, TOUCHLESS, LOW CONSUMPTION FLUSH VALVE WITH TOP PUSH BUTTON, WHITE VITREOUS CHINA URINAL WITH WASHOUT FLUSH ACTION, 0.5 GPF AND 3/4" TOP SPUD FLUSH VALVE, AND CARRIER. ADULT ADA MOUNTING.	2"	2"	3/4"	-	3	17" TO RIM OF BASIN
L-1	KOHLER K1728-0 SLOAN OPTIMA #EBF-650-BAT-BDT 0.5 GPM AERATOR CARRIER ZURN #Z1231 17 GA. DRAIN AND 17 GA. P-TRAP W/CLEAN OUT TRUEBRO KIT	19-1/4" X 17-1/4" WALL MOUNTED, WHITE VITREOUS CHINA LAVATORY WITH FRONT OVERFLOW AND CONCEALED ARMS SUPPORT, HOLES 4" ON CENTER FOR FAUCET, CHROME PLATED SUPPLY STOPS WITH STAINLESS STEEL FLEXIBLE CONNECTORS, CHROME PLATED DRAIN GRID AND TAILPIECE. DECK MOUNTED, TOUCHLESS BATTERY POWERED SENSOR FAUCET, 4" FIXED CENTERS, WITH BELOW DECK MOUNTED THERMOSTATIC MIXING VALVE, SET AT NO MORE THAN 105 DEGREES FAHRENHEIT AND CARRIER. ADULT STANDARD MOUNTING.	2"	2"	1/2"	1/2"	1,2,3	34" FROM FLOOR TO RIM
HS-1	ADVANCE TABCO 7-PS-90 MIXING VALVE LEONARD #270-LF-BRKT	10" X 14" PEDESTAL MOUNTED HAND SINK, 5" DEEP BOWL, 20 GAUGE, 304 STAINLESS STEEL, SPLASH MOUNTED GOOSENECK FAUCET. 3.5" DRAIN WITH CUP STRAINER, 1-1/2" 17 GAUGE CHROME PLATED TAILPIECE AND P-TRAP WITH CLEANOUT POINT-OF-USE THERMOSTATIC VALVE. SET HOT WATER TEMPERATURE AT NO MORE THAN 105 DEGREES FAHRENHEIT.	2"	2"	1/2"	1/2"	3	SEE ARCHITECTURAL
WH-1	ZURN # Z1300-SS-34UN	ENCASED ANTI-SIPHON AUTOMATIC DRAINING WALL HYDRANT FOR FLUSH INSTALLATION. COMPLETE WITH NON-FREEZE TYPE INTEGRAL BACKFLOW PREVENTER, BRONZE CASING, ALL BRONZE INTERIOR PARTS, NON-TURNING OPERATING ROD WITH FREE-FLOATING COMPRESSION CLOSURE VALVE, REPLACEABLE BRONZE SEAT AND SEAT WASHER. STAINLESS STEEL BOX AND HINGED COVER WITH OPERATING KEY LOCK AND "WATER" CAST ON COVER.	-	-	3/4"	-	3	
HB-1	ZURN #195 HOSE BIBB	EXPOSED TYPE, MILD CLIMATE, ANTI-CONTAMINATION WALL FAUCET WITH 1/2" MALE HOSE CONNECTION AND ANTI-SIPHON VACUUM BREAKER. THE EXTERIOR FINISH IS TO BE BRASS.	-	-	3/4"	-	-	
FD-1	ZURN # Z415B-ZN PROSET TRAP GUARD #TG-33-Z	FLOOR DRAIN BODY ASSEMBLY WITH TYPE B 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"	-	-	3	

NOTES:

1. PROVIDE TRUEBRO LAVATORY GUARD MODEL #103 E-Z COLOR WHITE. COVER SHALL BE SECURED WITH SNAP-SLIP FLUSH REUSABLE FASTENERS. ANGLE STOPS SHALL HAVE LOCK-UP LOCKING ACCESS COVERS.
2. PROVIDE OFFSET TAILPIECE FOR ALL ADA SINKS.
3. ALL THE PLUMBING FIXTURES ARE "OR AN APPROVED EQUAL"
4. INSTALL FLUSH VALVE ON THE WIDE SIDE OF STALL

INSTANTANEOUS ELECTRIC WATER HEATER SCHEDULE

Project: STISD Vocational Building Renovation

MARK	LOCATION	FLOW RATE GPM	DEGREE RISE AT 1.0 GPM FLOW RATE	ELECTRICAL V/PH	KW	DIMENSIONS LENGTH X WIDTH	MANUFACTURER & MODEL NUMBER	NOTES
IEWH-1	BOYS A106	0.8	36°	208V/ 1PH	4	10.125"X6.25"	CHRONOMITE M-20L/208-ADJ	1,2
IEWH-2	GIRLS A108	0.8	36°	208V / 1PH	4	10.125"X6.25"	CHRONOMITE M-20L/208-ADJ	1,2
IEWH-3	AUTOMOTIVE A102	0.8	36°	208V / 1PH	4	10.125"X6.25"	CHRONOMITE M-20L/208-ADJ	1,2

NOTES:

1. MANUFACTURER & MODEL NUMBER ARE "OR APPROVED EQUAL".
2. SET TEMPERATURE AT 110 DEGREE.
3. PROVIDE CHRONOMITE INVZIBLE WALL SLEEVE CONCEALED Z-S1212-CL

GENERAL NOTES:

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. SLEEVE ALL OUTSIDE WALLS, FOUNDATION GRADE BEAMS, INTERIOR WALL PENETRATIONS, AND FIRE SEAL ALL PENETRATION THROUGH FIRE WALLS AND FLOORS WHETHER SHOWN ON PLANS OR NOT.
7. RECORD INVERT ELEVATIONS OF ALL YARD CLEAN OUT (YCO) ON "AS-BUILT" DRAWINGS.
8. PROVIDE SHUT-OFF VALVES (STOPS) ON ALL ROUGH-INS TO FIXTURES AND EQUIPMENTS.
9. PROVIDE WATER HAMMER ARRESTORS AS INDICATED ON THE DRAWINGS. AIR CHAMBERS NOT AN APPROVED SUBSTITUTE.
10. PROVIDE ANY BACKFLOW PREVENTION DEVICE REQUIRED BY CODE OR LOCAL AUTHORITIES. CONTRACTOR SHALL VERIFY THIS WITH CITY AND LOCAL AGENCIES AND INCLUDE COST IN BID. CONTRACTOR TO HAVE BACK FLOWS CERTIFIED.
11. REFER TO PLUMBING FIXTURE ROUGH-IN SCHEDULE FOR INDIVIDUAL PIPE CONNECTIONS TO FIXTURES.
12. METAL STUDS AT DRY WALLS SHALL NOT BE CUT THRU HORIZONTAL DIRECTION. COORDINATE WITH DRY WALL CONTRACTOR.

PLUMBING SYMBOLS LEGEND

	COLD WATER SUPPLY	WCO	WALL CLEANOUT
	HOT WATER SUPPLY		*GATE VALVE (GV)
	HOT WATER RETURN		*BALL VALVE
	UNDERGROUND GAS LINE		VALVE IN RISER TYPE AS NOTED
	SOIL & WASTE LINE - ENLARGED PLANS	WC	WATER CLOSET
	VENT LINE - ENLARGED PLANS	UR	URINAL
FCO	FLOOR CLEANOUT	L	LAVATORY
FCO-2	FLOOR CLEANOUT - 2 WAY	SK	SINK
FD FD	FLOOR DRAIN (FD) WITH DEEP SEAL TRAP	EDF	ELECTRIC DRINKING FOUNTAIN
HDCC	HUB DRAIN WITH DEEP SEAL TRAP	MSB	MOP SERVICE BASIN
	FLOOR SINK	EESHR	EMERGENCY EYE/SHOWER
YCO	YARD CLEANOUT	TP	TRAP PRIMER
YCO-2	YARD CLEANOUT - 2 WAY	EWH	ELECTRIC WATER HEATER
WH	WALL HYDRANT	VTR	VENT THRU ROOF
	*WATER HAMMER	CO	CLEANOUT
GT	GREASE TRAP	ADT	ACID DILUTION TANK
	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
FCO	FLOOR CLEANOUT	MSB	MOP SERVICE BASIN
FD	FLOOR DRAIN (FD) WITH DEEP SEAL TRAP	SHR	SHOWER
FS	FLOOR SINK (FS) WITH DEEP SEAL TRAP	TP	TRAP PRIMER
HDCC	HUB DRAIN WITH DEEP SEAL TRAP	EWH	ELECTRIC WATER HEATER
YCO-2	YARD CLEANOUT - 2 WAY	VTR	VENT THRU ROOF
	WALL HYDRANT (WH)	CO	CLEANOUT
	*WATER HAMMER ARRESTOR (WHA)	EESHR	EMERGENCY EYE/SHOWER
	WYE FITTING		QUAZITE BOX WITH GATE VALVE
	45° ELBOW FITTING	H	SECTION VIEW CUT
	90° ELBOW FITTING	GWH	GAS WATER HEATER
	GAS METER	PSS	PRIMARY STORM SEWER
	BALL VALVE (BV)	SSD	SECONDARY STORM SEWER

* PROVIDE 12"x12" ACCESS PANEL WHERE INSTALLED IN AN INACCESSIBLE AREA.

No.	REVISIONS	BY

GMS ARCHITECTS
1150 Paredes Line Rd.
Brownsville TX 78526
(956) 546-0110
fax (956) 546-0196

SOUTH TEXAS I.S.D. - MERCEDES VOCATIONAL BUILDING RENOVATIONS

MERCEDES , TEXAS



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Gomez Mendez Saenz Inc.
Architects-Planners
Interior Designers

Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: MOV
Job No. 25v22
Sheet: P5.01

ethos engineering
1126 SOUT COMMERCE ST.
HARLINGEN, TX.
PHONE: 956-230-3435
TEXAS REGISTERED
ENGINEERING FIRM
F-15998



01 WC-1
SCALE: NOT TO SCALE



02 WC-2
SCALE: NOT TO SCALE



03 L-1
SCALE: NOT TO SCALE



04 UR-1&2
SCALE: NOT TO SCALE



05 FD-1
SCALE: NOT TO SCALE



06 WH-1
SCALE: NOT TO SCALE



07 HS-1
SCALE: NOT TO SCALE

No.	REVISIONS	BY

GMS ARCHITECTS

1150 Paredes Line Rd.
Brownsville TX 78526
(956) 546-0110
fax (956) 546-0196

SOUTH TEXAS I.S.D. - MERCEDES
VOCATIONAL BUILDING RENOVATIONS
MERCEDES , TEXAS



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Architects-Planners
Interior Designers

Date: 03/21/2025
Scale: As Noted
Project Architect: David Monreal, AIA
Drawn By: MOV
Job No. 25v22
Sheet: P5.02

ethos engineering
1126 SOUT COMMERCE ST.
HARLINGEN, TX
PHONE 956-230-3435
TEXAS REGISTERED
ENGINEERING FIRM
F-15998

LIST OF PROPOSED SUB-CONTRACTORS/SUPPLIERS

PROJECT: **JOCPROJ – SCI CTE Automotive Expansion 2025**

BIDDER: _____ DATE: _____

	ITEM NAME OF SUB-CONTRACTOR/SUPPLIER (As applicable)
PERFORMANCE-PAYMENT BONDS	
EARTHWORK	
IRRIGATION	
LANDSCAPING	
TERMITE CONTROL	
CONCRETE WALKS, CURBS AND PAVING	
METAL CANOPIES	
CONCRETE (CAST-IN-PLACE)	
UNIT MASONRY	
STONEWORK	
STRUCTURAL STEEL	
STEEL JOISTS	
STEEL DECKING	
LIGHTGAUGE METAL FRAMING	
METAL FABRICATIONS	
ROUGH CARPENTRY	
ARCHITECTURAL WOOD WORK	
BITUMINOUS WATERPROOFING	
INSULATION	
MODIFIED BITUMINOUS ROOFING SYSTEM	
FLASHING & SHEET METAL	
PREFORMED METAL ROOFING	
JOINT SEALERS	
STEEL DOORS	
FLUSH WOOD DOORS	
ALUMINUM DOORS & FRAMES	
FINISH HARDWARE	
GLAZED ALUMINUM CURTAIN WALL	
GLASS & GLAZING	
ACCESS DOORS	
OVERHEAD GRILLE DOORS	
LATH & PLASTER	
GYPSUM DRYWALL	
TILE	
ACOUSTIC CEILINGS	
RESILIENT FLOORING	
CARPETING	
PAINTING	
TOILET PARTITIONS	
DIVISION 10 SPECIALTIES	
DIVISION 11 - EQUIPMENT	
AUDITORIUM SEATING	
AUDIO/VIDEO SYSTEMS	
SOUND REINFORCEMENT SYSTEM	
MECHANICAL	
ELECTRICAL	
TEMPERATURE CONTROLS	
PLUMBING	

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)
      - Ethics Form 1295
      - South Texas ISD EDGAR Certifications
   d. South Texas ISD ACH Form
   e. Certification of Criminal History Record Information (if working directly with students)

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

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

Always Innovating
South Texas ISD
RIO GRANDE VALLEY | GRADES 6-12

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.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

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

OFFICE USE ONLY

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

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

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

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

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

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

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

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

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

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

ADD ADDITIONAL PAGES AS NECESSARY

MUST FILE ONLINE AT WWW.ETHICS.STATE.TX.USFILE

SOUTH TEXAS INDEPENDENT SCHOOL DISTRICT
NON-COLLUSIVE BIDDING CERTIFICATE
BID ACCEPTANCE FORM

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

1. The undersigned affirms that they are duly authorized to execute this contract;

2. This bid or proposal has been independently arrived at without collusion with any other Bidder or with any Competitor;
3. This bid or proposal has not been knowingly disclosed and will not be knowingly disclosed, prior to the opening of bids, or proposals for this project, to any other Bidder, Competitor or potential competitor:
4. No attempt has been or will be made to induce any other person, partnership or corporation to submit or not to submit a bid or proposal;
5. The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties being applicable to the Bidder as well as to the person signing in its behalf.

Signature below certifies accuracy of answers to all sections on this page.

_____

FIRM NAME

DOING BUSINESS AS (dba)

ADDRESS

CITY, STATE, ZIPCODE

TELEPHONE NUMBER

FAX NUMBER

EMAIL ADDRESS

SIGNATURE FO COMPANY OFFICIAL AUTHORIZING THIS PROPOSAL

COMPANY OFFICIAL (PRINT NAME)

OFFICIAL TITLE/POSITION

Always Innovating

South Texas ISD

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 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 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 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 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 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 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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5. Declaration of Business Location- TEC 44.031(b)(8)

By signing below, Bidder certifies the 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, Bidder certifies the owner(s) name of the business submitting 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

Contractor certifies the 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, Contractor certifies that 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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Proposer} 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 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 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 proposers so as to give the undersigned an 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 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 proposal; the Proposer 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 proposal, the submission of this proposal, the award of this proposal or the performance, delivery or sale pursuant to this proposal; the {Proposer} certifies that the Proposer has not prepared this proposal and will not prepare any future proposals arising from this Request for Proposal (RFP) in collusion with any other respondent, and that the content of any future proposals arising out of this RFP 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 selection of a contractor for this RFP.

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, Proposer 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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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 Proposer 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 Proposer 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 Proposer.

18. Access to Records

Proposer 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

Proposer 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. 02/2024

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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