

**GALVESTON COUNTY
PURCHASING DEPARTMENT**



REQUEST FOR PROPOSAL

RFP #B241016

GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION

PROPOSAL DUE DATE: 02/08/2024

2:45 P.M.

***Rufus Crowder, CPPO, CPPB
Purchasing Agent
Galveston County
722 Moody (21st Street)
Fifth (5th) Floor
Galveston, Texas 77550
(409) 770-5372***



**REQUEST FOR PROPOSAL
GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION
GALVESTON COUNTY, TEXAS**

Purpose:

Galveston County is seeking proposals from qualified building/renovation contractors to assist Galveston County in the renovation of a 21,200 SF existing building located at 1207 Oak Street, La Marque, Texas 77568, that was used as a Community Health Center. The renovation will convert the building into a social rehabilitation facility that houses 20 beds. The renovation includes architectural, structural, civil, mechanical, electrical, landscaping, plumbing and fire protection. Interior demolition, and associated remediation/abatement has been performed; however, remediation/abatement and disposal of asbestos containing materials will be required at the parapet walls. Asbestos reports are attached to this document.

Sealed proposals in **sets of four (4), one (1) unbound single-sided original and three (3) single-sided copies**, will be received in the office of the Galveston County Purchasing Agent **until 2:45 P.M. CST, on Thursday, February 8, 2024** and opened immediately in that office in the presence of Galveston County Auditor and the Purchasing Agent. Sealed proposals are to be delivered to Rufus G. Crowder, CPPO CPPB, Galveston County Purchasing Agent at the Galveston County Courthouse, 722 Moody, (21st Street), Floor 5, Purchasing, Galveston, Texas 77550, (409) 770-5372.

The time stamp clock located in the Purchasing Agent's office shall serve as the official time keeping piece for this solicitation process. Any proposals received after 2:45 P.M. CST on the specified date will be returned unopened.

All submittals must be marked on the outside of the sealed envelope:

RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction

Respondent's name, return address, should be prominently displayed on the proposal package for identification purposes.

PROCUREMENT TIMELINE

A timeline for this solicitation and initial process is included below. Galveston County reserves the right to change these dates and will notify Respondents of any changes:

Advertise Solicitation (first date of publication)	Friday, January 19, 2024
Advertise Solicitation (second date of publication)	Friday, January 26, 2024
Non-Mandatory Pre-Proposal Conference/Site Visit	Tuesday, January 30, 2024 at 10:00 a.m.
Deadline for Questions & Inquiries	Wednesday, January 31, 2024 by 2:00 p.m.
Submission Deadline / RFP Opening	Thursday, February 8, 2024 at 2:45 p.m.

Virtual Bid Opening:

Interested parties can attend the Thursday, February 8, 2024 at 2:45 p.m. bid opening virtually. Join the meeting link below:

Join from the Meeting Link:

<https://galvestoncountytexas.webex.com/galvestoncountytexas/j.php?MTID=m972e273fb0c9d9dce388556c99df0099>

Non-Mandatory Pre-Proposal Conference:

A non-mandatory pre-proposal conference will be held on Tuesday, January 30, 2024, at 10:00 AM CST at 9850 Emmett F. Lowry Expressway, Texas City, TX 77591

Or

Interested parties can attend the non-mandatory pre-proposal conference virtually by using the following link:

Join from the Meeting Link:

<https://galvestoncountytexas.webex.com/galvestoncountytexas/j.php?MTID=m48cd5d5af531d773a592717875a5dc72>

Site Visit:

A site visit will be held on Tuesday, January 30, 2024 immediately following the pre-proposal conference. **This site visit is not mandatory but is it strongly suggested that you attend. The site visit will be held at:**

1207 S. Oak Street, La Marque, TX 77568

Plans and Specifications: Specifications can be obtained at the office of the Galveston County Purchasing Agent, located in the Galveston County Courthouse, 722 Moody, (21st Street), Floor 5, Purchasing, Galveston, Texas, 77550, or by visiting the Galveston County website @ <http://www.galvestoncountytexas.gov/county-offices/purchasing>

Pricing: Submitted prices, if required and applicable, shall be either lump sum or unit prices as shown on bid sheets. The net price shall be delivered to Galveston County, including all freight, shipping, and license fees. Galveston County is tax exempt, and no taxes should be included in proposal pricing.

Bonding Requirements:

- **BID GUARANTEE:** Evidencing its firm commitment to engage in the contract if Bidder is selected for award of contract, each Bidder is required to furnish with their proposal a Cashier's Check, or an acceptable Bidder's Bond, in the amount of five percent (5%) of the total contract price. The Bidder's Bond must be executed with a surety company authorized to do business in the State of Texas. Failure to furnish the bid/proposal guarantee in the proper form and amount, by the time set for opening of bids may be cause or rejection of the proposal.
- **PERFORMANCE AND PAYMENT BONDS:**
Successful bidder, before beginning work, shall execute a performance bond and a payment bond, each of which must be in the amount of the contract. The required payment and performance bonds must each be executed by a corporate surety in accordance with Section 1, Chapter 87, Acts of the 56th Legislature, Regular Session, 1959 (Article 7.19-1, Vernon's Texas Insurance Code).
- **DAVIS-BACON WAGE RATES:**
Davis-Bacon Wage Rates are requirements for this solicitation.
Attention is called to the fact that not less than, the federally determined prevailing (Davis-Bacon and Related Acts) wage rates are required to be paid to laborers and mechanics. When required by Federal program legislation, all prime construction contracts in excess of \$2,000 must include a provision for compliance with the Davis-Bacon Act as supplemented by the Department of Labor regulations (29 C.F.R. Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractor must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. In addition, contractors must be required to pay wages not less than once a week. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, or national origin. Please reference the General Provisions, item 69, Procurement Laws, sub-item 3, **Davis-Bacon Act as amended (40 U.S.C. 3141-3148)**.
- **DEBARMENT AND SUSPENSION:**
To participate in this solicitation, respondent certifies that neither it, nor any of its principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. All contractors/subcontractors that are debarred, suspended, or otherwise excluded from or ineligible for participation on federal assistance programs may not undertake any activity in part or in full under this project

The Galveston County Commissioners' Court reserves the right to waive any informality and to reject any and all bids and to accept the bid or bids which, in its opinion, is most advantageous to Galveston County with total respect the governing laws.

Rufus G. Crowder, CPPO CPPB
Purchasing Agent
Galveston County

GENERAL PROVISIONS

REQUEST FOR PROPOSAL GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION GALVESTON COUNTY, TEXAS

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The Special Provisions and the General Provisions of this Request for Proposal and the Exhibits attached hereto are made a part of this agreement between the Parties. In the event of a conflict between the General Provisions and the Special Provisions, the terms of the Special Provisions shall control.

This solicitation is issued under the general guidance and mandates as referenced in the *Texas Local Government Code, SUBCHAPTER C. COMPETITIVE BIDDING IN GENERAL, Sec. 262.021. SHORT TITLE. This subchapter may be cited as the County Purchasing Act.*

Interested parties are requested to familiarize themselves with these provisions as well as the entire General and Special Provision sections of this document prior to participating and submitting a response to this request.

1. RFP PACKAGE

*The Request for Proposal, General and Special provisions, drawings, specifications/line-item details, contract documents, addenda (if any), and the Proposal are all part of the Proposal package and Resultant Contract. **Proposals must be submitted in sets of four (4), one (1) unbound original, and three (3) copies,** on the forms provided by the County if County forms are provided and shall include the Proposal sheets completed in their entirety and signed by an authorized representative by original signature. Failure to complete and sign the Proposal sheets/contract page(s) may disqualify the Proposal from being considered by the Commissioners' Court. Any individual signing on behalf of the Proposer expressly affirms that he or she is duly authorized to tender this Proposal and to sign the Proposal under the terms and conditions in this request for Proposal on behalf of the Proposer and to bind the Proposer to the terms and conditions of this request for Proposal and the Proposer's response hereto.*

Proposer further understands that Proposers' signing of the contract shall be of no effect unless the contract is subsequently awarded by the Commissioners' Court and the contract properly executed by the Commissioners' Court.

All figures must be written in ink or typed. Figures written in pencil or with erasures are not acceptable. However, mistakes may be crossed out, corrections inserted, and initialed in ink by the individual signing the Proposal. If there are discrepancies between unit prices quoted and extensions, the unit price shall prevail.

Each Proposer is required to thoroughly review this entire Request for Proposal package to familiarize themselves with the Proposal procedures, the plans and specifications for the requested work, as well as the terms and conditions of the contract the successful Proposer will execute with the County.

2. PROPOSER'S RESPONSIBILITY

The Proposer must affirmatively demonstrate its responsibility. The Proposer must also meet the following minimum requirements:

- A. have adequate financial resources or the ability to obtain such resources as required;
- B. be able to comply with all federal, state, and local laws, rules, regulations, ordinances, and orders regarding this request for Proposal;
- C. have a satisfactory record of performance;
- D. have a satisfactory record of integrity and ethics; and
- E. be otherwise qualified and eligible to receive an award.

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3. TIME FOR RECEIVING PROPOSALS

Proposals may be submitted by mail or hand delivery and **must be submitted only to the Galveston County Purchasing Agent**. If by delivery, the Proposer must deliver the Proposal to the reception desk in the County Purchasing Agent's Office. The delivery and mailing instructions for the Galveston County Purchasing Agent are the following:

**Rufus Crowder, CPPO CPPB
Galveston County Purchasing Agent
722 Moody, Fifth (5th) Floor
Galveston, Texas 77550**

Proposals will **not** be accepted by facsimile transmission or by electronic mail (email) unless superseded by instructions within the Special Provisions section of this solicitation. Proposals must be received by the County Purchasing Agent on or before the deadline for the opening of the Proposals. **For clarity, mailing date/postmark is not sufficient – Proposals must be received by the County Purchasing Agent on or before the deadline.** Late Proposals will not be accepted and will be returned to the Proposer unopened. Proposals received prior to the submission deadline will be maintained unopened until the specified time for opening.

The County Purchasing Agent will accept Proposals from 8:00 a.m. to 5:00 p.m. on each business day up to the submission deadline. Business days do not include Saturdays and Sundays, and do not include other days in which the County is closed for business in observance of holidays or for other reasons.

The time-stamp clock within the County Purchasing Agent's Office shall be the official time clock for the purpose of this solicitation and thus shall be the determinant of whether the Proposal was timely received.

The Proposer should prominently identify the procurement number and name on the outside of the envelope/ mailing package. If the Proposer fails to identify the request for Proposal number and name on the outside of the envelope as required, the Purchasing Agent will open the envelope for the sole purpose of identifying the solicitation number for which the submission was made. The envelope will then be resealed. No liability will attach to a County office or employee for the premature opening of a Proposal.

If a Proposal is not submitted, return this Request for Proposal and state reason (s), otherwise your name may be removed from the Purchasing Agent's mailing list.

4. COMPETITIVENESS, INTEGRITY, INQUIRIES AND QUESTIONS

To prevent biased evaluations and to preserve the competitiveness and integrity of the procurement process, **Proposers are to direct all communications regarding this Request for Proposal only to the Galveston County Purchasing Agent**, unless otherwise specifically noted.

Do not contact the requesting department. Attempts by offering firms to circumvent this requirement will be viewed negatively and may result in rejection of the Proposal of the firm found to be in non-compliance.

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All questions regarding this Request for Proposal must be submitted in writing to:

**Rufus Crowder, CPPO CPPB
Purchasing Agent
722 Moody
Fifth (5th) Floor
Galveston, Texas 77550
Fax: (409) 621-7997
E-mail: purchasing.bids@co.galveston.tx.us**

All questions received and the responses thereto will be mailed, emailed, or faxed to all prospective Proposers by addendum. No inquiries except clarification of instructions will be addressed by telephone.

Proposer is advised to carefully review this Request for Proposal – it provides specific information necessary to aid participating firms in formulating a thorough response. Proposer's failure to examine all documents shall not entitle the Proposer to any relief from the conditions imposing in the Request for Proposal and the resultant contract.

An authorized person from the Proposer must sign the Proposal. This signatory must be a person from the submitting firm who is duly authorized to tender and sign the Proposal on behalf of the Proposer and to bind the Proposer to the terms and conditions of this Request for Proposal, the Proposer's response, and all other terms and conditions of the contract. By this signature, the Proposer further acknowledges that the Proposer has read the request for Proposal and Proposal documents thoroughly before submitting a Proposal and will fulfill the obligations in accordance with the terms, conditions, and specifications detailed herein.

5. PROPOSAL OPENING

The Purchasing Agent shall open the Proposals on the date and time specified herein. Proposals shall be opened in a manner that avoids disclosure of the contents to competing offerors and that keeps the Proposals secret during negotiations. The Purchasing Agent will examine Proposals promptly and thoroughly. **Upon opening, no Proposal may be withdrawn for a period of sixty (60) calendar days after the Proposal opening date.**

6. WITHDRAWAL OF PROPOSAL / FIRM PROPOSAL RULE

Proposers may request withdrawal of their sealed Proposal prior to the scheduled Proposal opening time provided the request for withdrawal is submitted to the Purchasing Agent in writing. No Proposals may be withdrawn for a period of sixty (60) calendar days after opening of the Proposals.

7. COMMISSIONERS' COURT

No contract is binding on the County until it is properly placed on the Commissioners' Court agenda, approved in open Court, authorized to be executed by the County Judge, and fully executed by both parties.

Department heads and elected officials are not authorized to enter into any type of agreement or contract on behalf of the County. Only the Commissioners' Court acting as a body may enter into a contract on behalf of and contractually bind the County. Additionally, department heads and elected officials are not authorized to agree to any type of supplemental agreements or contracts for goods or services.

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Supplemental agreements are subject to review by the County Legal Department prior to being accepted and signed by the County's authorized representative.

8. REJECTION OF PROPOSALS / DISQUALIFICATION

Galveston County, acting through its Commissioners' Court, reserves the right to:

- reject any and all Proposals in whole or in part received by reason of this request for Proposal;
- waive any informality in the Proposals received;
- disregard the Proposal of any Proposer determined to be not responsible;
- disregard the Proposal of any Proposer determined to have not submitted its Proposal timely; and/or
- discontinue its efforts for any reason under this request for Proposal package at any time prior to actual execution of contract by the County.

Proposers may be disqualified, and rejection of Proposals may be recommended to the Commissioners' Court for any of (but not limited to) the following causes:

- A. Failure to use the Proposal forms furnished by the County, if applicable;
- B. Lack of signature by an authorized representative of Proposer;
- C. Failure to properly complete the Proposal;
- D. Engaging in communications regarding this procurement during the pendency of this procurement with County officials and/or personnel who are not within the Purchasing Department;
- E. Failure to meet the mandatory requirements of this request for Proposal; and/or
- F. Evidence of collusion among Proposers.

9. RESTRICTIVE OR AMBIGUOUS SPECIFICATIONS

It is the responsibility of the prospective Proposer to review the entire request for Proposal packet and to notify the Purchasing Agent if the specifications are formulated in a manner that would restrict competition or appear ambiguous. Any protest or question(s) regarding the specifications or Proposal procedures must be received in the Purchasing Agent's Office not less than seventy-two (72) hours prior to the time set for Proposal opening. Proposers are to submit their Proposal as specified herein or propose an approved equal.

10. SUBSTITUTES / DESCRIPTION OF MATERIALS AND EQUIPMENT

Any brand name or manufacturer reference used herein is intended to be descriptive and not restrictive, unless otherwise noted, and is used to indicate the type and quality of material. The term "or equal" if used, identifies commercially produced items that have the essential performance and salient characteristics of the brand name stated in the item description. All supplies, material, or equipment shall be new and of the most suitable grade for the purpose intended. For clarification, "new" includes products containing recovered materials that are EPA-designated items and additionally see Section 63 of these General Provisions on contracts involving federal funds. It is not the County's intent to discriminate against any materials or equipment of equal merit to those specified. However, if Proposer desires to use any substitutions, prior written approval must be obtained from the Purchasing Agent and sufficiently in advance such that an addendum may be issued. All material supplied must be one hundred percent (100%) asbestos free. Proposer, by submission of its Proposal, certifies that if awarded any portion of this procurement, the Proposer will supply only material and equipment that is 100% asbestos free.

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11. EXCEPTIONS TO PROPOSAL CONDITIONS

The Proposer will list on a separate sheet of paper any exceptions to the conditions of this request for Proposal. This sheet will be labeled, "Exceptions to Proposal Conditions", and will be attached to the Proposal. If no exceptions are stated, **it will be understood that all general and special conditions will be complied with, without exception.**

The Proposer must specify in its Proposal any alternatives it wishes to propose for consideration by the County. Each alternative should be sufficiently described and labeled within the Proposal and should indicate its possible or actual advantage to the program being offered.

The County reserves the right to offer these alternatives to other Proposers.

12. AWARDED PRICES

During the contractual period of the resultant contract, any prices submitted by the respondent shall include all costs to the County, including the material, delivery, current freight rate, state tax, or any other cost.

Award prices include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work. Whenever the Awardee is required or desires to use any design, device, material or process covered by letters of patent or copyright, the Awardee shall indemnify and save harmless the County, its officers, agents and employees from any and all claims for infringement by reason of the use of any such patented design, tool, material, equipment, or process, to be performed under the contract, and shall indemnify the County its officers, agents, and employees for any costs, expenses and damages which may be incurred by reason of any infringement at any time during the prosecution or after the completion of the work.

Proposal pricing will be either lump sum or unit prices as shown on the Proposal sheets if included. The net priced items will be delivered to Galveston County, including all freight, shipping, and delivery charges. Galveston County is a tax-exempt local government of the State of Texas, therefore, no taxes shall be included with submitted pricing.

Cash discount must be shown on the Proposal, otherwise prices will be considered net. Unless prices and all information requested are complete, the Proposal may be disregarded and given no consideration.

In case of default by the contractor, the County of Galveston may procure the articles or services from other sources and may deduct from any monies due, or that may thereafter become due to the contractor, the difference between the price named in the contract of purchase order and the actual cost thereof to the County of Galveston. Prices paid by the County of Galveston shall be considered the prevailing market price at the time such purchase is made. Periods of performance may be extended if the facts as to the cause of delay justify such extension in the opinion of the Purchasing Agent and the Commissioners' Court.

13. PROCUREMENT CARD (P-CARD) PROGRAM

The County of Galveston participates in a Procurement Card (P-Card) program that allows payments made to a vendor by credit card. This method typically results in substantially faster bill payments, sometimes within three (3) to five (5) days of the actual transaction date. All transaction fees from the card provider are to be paid by the successful contractor. If awarded company will accept payment via credit card (Visa, MasterCard, etc.), this should be notated in the Proposal submittal.

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14. PASS THROUGH COST ADJUSTMENTS

Except in instances of extreme extenuating circumstances, Contractor prices shall remain firm throughout the contract period and any renewals. Examples of extreme extenuating circumstances include such situations as a nationwide rail strike, oil shortage or oil embargo.

In extreme extenuating circumstances, Contractors may be allowed to temporarily “pass through” additional costs they are forced to incur through no fault of their own. A request for a pass-through cost increase will not be considered unless a Contractor’s cost for the Contractor’s product exceeds 10% over the original cost for the product. Also, the increase in cost must be nationwide and consistent for a minimum period of sixty (60) calendar days. Costs that historically are anticipated to rise over a period of time (for example only, such as wages or insurance costs) do not qualify for pass through. If a Contractor thinks he will be asking for a pass-through cost adjustment during the term of the contract, then the original cost of the product to Contractor must be stated in Contractor’s original Proposal.

A request for a pass-through cost does not guarantee that one will be granted. Contractors must submit such information on each request as required by the County Purchasing Agent. The County Purchasing Agent will review each request on a case-by-case basis and if valid submit the request to the Commissioners’ Court for authorization and determination of the appropriateness of each request as well as amount and duration of increase. Contractors will not be permitted any additional compensation for mark-ups or profits based on the increase in price. Rather, such additional compensation will be limited to the actual increase in original cost to the Contractor as such increase is reflected by the original cost stated in the Proposal. But in no event will the amount of additional compensation exceed 25% increase in Contractor’s original cost for the product as such cost is reflected in Contractor’s original Proposal or the duration exceed a period of sixty (60) calendar days. In addition, should the cost, during the period of the pass through, return to normal or decrease to below pre pass through prices, appropriate downward adjustments shall be made. No more than one pass through adjustment will be permitted per year.

15. MODIFICATION OF PROPOSALS

A Proposer may modify a Proposal by letter at any time prior to the submission deadline for receipt of Proposals. Modification requests must be received by the Purchasing Agent prior to the submission deadline. Modifications made before opening time must be initialed by Proposer guaranteeing authenticity. Proposals may not be amended or altered after the official opening with the single exception that any product literature and/or supporting data required by the actual specifications, if any, will be accepted at any time prior to the Commissioners’ Court considering of same.

16. PRE-PROPOSAL CONFERENCE

A pre-Proposal conference for the purpose of discussing contract requirements and answering questions of prospective Proposers may be conducted in this procurement. A pre-Proposal conference may be mandatory or voluntary. If the pre-Proposal conference is mandatory, then the County is authorized to condition acceptance of a Proposal on compliance with attendance. The Special Provision section of this procurement shall specify if a pre-Proposal conference is to be held and shall specify whether the pre-Proposal conference is mandatory or voluntary. Regardless of whether the pre-Proposal conference is mandatory or voluntary, only a principal, officer, or employee of the Proposer may represent the Proposer at the pre-Proposal conference and no person may represent more than one Proposer at the pre-Proposal conference.

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17. SIGNATURE OF PROPOSALS

Each Proposal shall give the complete name of the Proposer and the mailing address of the Proposer and be signed by an authorized representative by original signature with the authorized representative's name and legal title typed below the signature line. Each Proposal shall include the Proposer's Federal Employer Identification Number (FEIN). Failure to sign the Contract page(s) and Proposal response sheets may disqualify the Proposal from being considered by the County. The person signing on behalf of the Proposer expressly affirms that the person is duly authorized to tender the Proposal on behalf of the Proposer and to sign the Proposal sheets and contract under the terms and conditions of this Request for Proposal and to bind the Proposer hereto and further understands that the signing of the contract shall be of no effect until it is properly placed on the Commissioners' Court agenda, approved in open Court, authorized to be executed by the County Judge, and fully executed by both parties.

18. AWARD OF PROPOSALS – EVALUATION CRITERIA AND FACTORS

The award will be made to the responsible Proposer whose Proposal is determined to be the lowest and best evaluated offer demonstrating the best ability to fulfill the requirements set forth in this Request for Proposal. **The proposed cost to the County will be considered firm and cannot be altered after the submission deadline, unless the County invokes its right to request a best and final offer.**

"Lowest and best" means a Proposal or offer providing the best value considering associated direct and indirect costs, including transport, maintenance, reliability, life cycle, warranties, and customer service after a sale.

In determining the lowest and best Proposal for a contract for the purchase of earth-moving, material-handling, road maintenance, or construction equipment, the Commissioners' Court may also consider the information submitted under Section 262.0255 of the Local Government Code; and in determining the lowest and best Proposal for a contract for the purchase of road construction material, the Commissioners' Court may consider the pickup and delivery locations of the Proposers and the cost to the county of delivering or hauling the material to be purchased. The Commissioners' Court may award contracts for the purchase of road construction material to more than one Proposer if each of the selected Proposers submits the lowest and best Proposal for a particular location or type of material.

Each Proposer, by submitting a Proposal, agrees that if its' Proposal is accepted by the Commissioners' Court, the Proposer will furnish all items and services upon which prices have been tendered and upon the terms and conditions in this Proposal, including but not limited to the best and final offer if applicable, and the contract.

The contractor shall commence work only after the transmittal of a fully executed contract and after receiving written notification to proceed from the County Purchasing Agent. The contractor will perform all services indicated in the Proposal in compliance with this contract.

Neither department heads nor elected officials are authorized to sign any binding contracts or agreements prior to being properly placed on the Commissioners' Court agenda and approved in open court. Department heads and other elected officials are not authorized to enter into any type of agreement or contract on behalf of Galveston County. Only the Commissioners' Court, acting as a body, may enter into a contract on behalf of the County. Additionally, department heads and other elected officials are not authorized to agree to any type of supplemental agreements or contracts for goods or services. Supplemental agreements are subject to review by the County's legal counsel prior to being signed by the County's authorized representatives.

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The County of Galveston reserves the right to accept Proposals on individual items listed, or group items, or on the Proposal as a whole; to reject any and all Proposals; to waive any informality in the Proposals; to disregard Proposals that are not submitted timely; to disregard the Proposals of Proposers determined to be not responsible; and to accept the Proposal that appears to be in the best interest of the County. The selection process may, however, include a request for additional information or an oral presentation to support the written Proposal.

In determining and evaluating the best Proposal, the pricing component may not necessarily be controlling, but quality, equality, efficiency, utility, general terms, delivery, suitability of the service offered, and the reputation of the service in general use will also be considered along with any other relevant items.

The County reserves the right to reject any or all Proposals in whole or in part received by reason of this Request for Proposal and may discontinue its efforts under this Request for Proposal for any reason or no reason or solely for the County's convenience at any time prior to actual execution of the contract by the County.

A Proposer whose Proposal does not meet the mandatory requirements set forth in this request for Proposal will be considered non-compliant.

The invitation to submit a Proposal which appears in the newspaper, or other authorized advertising mediums, these general provisions, the special specifications which follow, the Proposal sheets, forms, and any addenda issued are all considered part of the Proposal and resultant contract.

Each Proposer, by submitting a Proposal, agrees that if its Proposal is accepted by the Commissioners' Court, such Proposer will furnish all items and services upon the terms and conditions in this request for Proposal and the resultant contract.

Notice of contract award is anticipated to be made within ninety (90) days of opening of Proposals to the lowest responsive and responsible contractor, whose Proposal complies with all the requirements in the request for Proposal.

Contractor shall submit to the County, for approval, within ten (10) days from notice of contract award, all Certificates of Insurance evidencing the required coverage as described under Section 37, Requirement of and Proof of Insurance, or if different, then as described within the Special Provisions or resultant contract.

The contractor shall not commence work under these terms and conditions of the contract until all applicable Purchase Orders, Certificates of Insurance, Performance and Payment Bonds, and Irrevocable Letters of Credit (if required) have been approved by the County of Galveston and the Contractor has received notice to proceed in writing and an executed copy of the contract from the County Purchasing Agent.

19. DISPUTE AFTER AWARD / PROTEST

Any actual or prospective Proposer who is allegedly aggrieved in connection with this procurement or award of a contract resulting therefrom may protest. The protest shall be submitted in writing to the Purchasing Agent within seven (7) calendar days after such aggrieved person knows of or should have known of the facts giving rise thereto. If the protest is not resolved by mutual agreement, the Purchasing Agent will promptly issue a decision in writing to the protestant. If the protestant wishes to appeal the decision rendered by the Purchasing Agent, such appeal must be made to the Commissioners' Court

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through the Purchasing Agent. The decision of the Commissioners' Court will be final. The Commissioners' Court need not consider protests unless this procedure is followed.

20. PUBLIC INFORMATION ACT (f/k/a Open Records Act)

The Proposer acknowledges that the County is a government body for purposes of the Public Information Act, codified as Chapter 552 of the Texas Government Code, and as such is required to release information in accordance with the provisions of the Public Information Act.

If Proposer considers any of its submitted information to be proprietary in nature, trade secret, or otherwise confidential, then it must clearly and conspicuously mark such information as proprietary, trade, secret, or confidential. By the submission of its Proposal, Proposer expressly affirms that it has clearly and conspicuously marked any information within its submission that Proposer considers confidential, proprietary, and/or trade secret.

In the event the County receives a request for information under the Public Information Act seeking information that the Proposer has marked as confidential, proprietary, and /or trade secret, then the County agrees that it shall provide notice to the Proposer of the request for information and the request for decision process under the Public Information Act. Thus, the County will submit the initial correspondence to the Texas Attorney General – however, the burden is and shall be on the Proposer to submit correspondence to the Attorney General if the Proposer wishes its information to be withheld. Proposer is deemed to have knowledge of the Public Information Act. **By the submission of its Proposal, Proposer expressly acknowledges that the burden to withhold its' information from public disclosure lays with the Proposer;** thus, Proposer further acknowledges and agrees that it shall submit comments to the Texas Attorney General in the request for decision process if Proposer wishes to have its' information withheld from public disclosure.

21. PROPOSER'S E-MAIL ADDRESSES – CONSENT TO DISCLOSURE

Notwithstanding the foregoing Section 20, Proposer acknowledges and agrees that the confidentiality of all email addresses Proposer uses or discloses in communicating with the County are **open** to the public in accordance with Section 552.137 of the Government Code and Proposer consents to the release of its email addresses.

22. RESULTANT CONTRACT

Proposer should submit a proposed contract / agreement with its response, or its sample material terms and conditions for review and consideration.

It is the intent of this solicitation to enter a contract that meets State and Federal guidelines. It is imperative that all responders seeking a contract under this solicitation effort, familiarize and adhere to the requirements of the General Provisions, Special Provisions, and the procurement standards as referenced in 2 C.F.R. Part 200, Sections 200.317-200.326, and Appendix II, 2 C.F.R. Part 200. Sections 200.317–200.326 and Appendix II are referenced in the General Provisions section of this solicitation.

The resultant contract consists of the following documents: Request for Proposal, General Provisions, Special Provisions, General Terms and Conditions (including specifications, drawings, and addenda), Proposer's Proposal, Proposal Sheets, contract award, and any other documents referenced herein or

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attached hereto for the work. Collectively these documents may also be referred to as the Plans and Specifications.

The Galveston County Commissioners Court, and/or authorized designees will be responsible for negotiating with the successful contractor, the scope of work, the standards of performance, the specific technology provided, and the support services required for the proposed projects. All contractual amendments will be processed in accordance with Galveston County Purchasing Policies and Procedures.

Amendments will also be brought to Galveston County Commissioners' Court for approval as deemed necessary. The approval process serves to ensure the project technology and/or service is within the scope of the resultant contract, and that pricing meets the agreed upon pricing methodology as specified in the contract, and that funds are available.

Proposer shall correctly and fully execute the resultant contract first. After this, the contract shall be set for consideration by the Commissioners' Court. If the Commissioners' Court authorizes the execution of the contract, the resultant contract shall become effective upon the Commissioners' Court execution of same, provided that the contract is executed by all parties to the contract. Contract documents shall consist of the contract, the General and Special Provisions, drawings, solicitation package (including best and final offer(s) if such is utilized), any addenda issued, and any change orders issued during the work. If applicable to the attached Proposal, Proposer must sign three (3) original contracts and return all three with their Proposal submittal.

The Contractor shall procure all permits, licenses, certificates, or any such approvals of plans or specifications as may be required by federal, state, and local laws, ordinances, rules, and regulations, for the proper execution and completion of the work under the resultant agreement.

The Contractor is responsible for all damage or loss by fire, theft or otherwise, to materials, tools, equipment, and consumables, left on County property by the contractor.

The resultant agreement is considered a non-exclusive agreement between the parties.

The successful contractor hereby certifies that this agreement is made without prior understanding, agreement or connection with any corporation, firm or person who submitted Proposals for the Work covered by

The resultant agreement and is in all respects fair and without collusion or fraud. As to Contractor, the successful contractor hereby warrants and certifies that he/she is authorized to enter into this agreement and to execute same on behalf of the Contractor as the act of the said Contractor.

The agreement, including the General and Special Conditions and all amendments or addenda issued by the county, contains all the terms and conditions agreed upon by the parties. No other agreements, oral or otherwise, regarding the subject matter of the resultant agreement shall be deemed to exist or to bind either party hereto.

To satisfy cost reasonableness responsibilities at the time of any extension period, the County of Galveston reserves the right to obtain additional quotes and current pricing information from the successful contractor and other contractors to perform the work as stated per the specification listed herein and in the resultant. The solicited results may be used by the County to determine if the contract extensions will be considered, or other service options be utilized.

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23. CONTRACT TERM

The term of the resultant contract will begin on the date of full execution or the execution by the Commissioners' Court, whichever is later, and will terminate on the date specified in the resultant contract unless terminated earlier as herein set forth.

24. COLLATERAL CONTRACT

The County reserves the right to provide by separate contract or otherwise, in such manner as not to delay its programs or damage said Contractor, all labor and material essential to the completion of the work that is not included in this contract.

Award prices include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work. Whenever the Awardee is required or desires to use any design, device, material or process covered by letters of patent or copyright, the Awardee shall indemnify and save harmless the County, its officers, agents and employees from any and all claims for infringement by reason of the use of any such patented design, tool, material, equipment, or process, to be performed under the contract, and shall indemnify the County its officers, agents, and employees for any costs, expenses and damages which may be incurred by reason of any infringement at any time during the prosecution or after the completion of the work.

25. TERMINATION FOR DEFAULT

Failure of either party in the performance of any of the provisions of this contract shall constitute a breach of contract, in which case either party may require corrective action within ten (10) business days from date of receipt of written notice citing the exact nature of such breach. Failure of the party being notified to take corrective action within the prescribed ten (10) business days, or failure to provide written reply of why no breach has occurred, shall constitute a Default of Contract.

All notices relating to default by Proposer of the provisions of the contract shall be issued by the County through its Legal counsel, and all replies shall be made in writing to the County's legal counsel. Notices issued by or issued to anyone other than the County's legal counsel shall be null and void and shall be considered as not having been issued or received.

Galveston County reserves the right to enforce the performance of this contract in any manner prescribed by law in the event of breach or default of this contract, and may contract with another party, with or without solicitation of Proposals or further negotiations. At a minimum, Proposer shall be required to pay any difference in service or materials, should it become necessary to contract with another source, plus reasonable administrative costs, and attorney fees.

In the event of Termination for Default, Galveston County, its agents, or representatives shall not be liable for loss of any profits anticipated to be made by Proposer.

In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

No waiver by either party of any event of default under this agreement shall operate as a waiver of any subsequent default under the terms of this agreement.

County reserves the right to terminate this contract immediately in the event Proposer:

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- A. Fails to meet delivery or completion schedules; and/or
- B. Fails to otherwise perform in accordance with the accepted Proposal and the contract.

26. TERMINATION FOR CONVENIENCE

County may terminate this contract upon at least thirty (30) calendar days prior written notice for its convenience or for any reason deemed by the County to serve the public interest. As well, County may terminate this contract upon thirty (30) calendar days prior written notice for any reason resulting from any governmental law, order, ordinance, regulation, or court order. In no event shall County be liable for loss of any profits anticipated to be made hereunder by Proposer should this contract be terminated early.

27. FORCE MAJEURE

If by reason of Force Majeure either Party shall be rendered unable, wholly or in part, to carry out its responsibilities under this contract by any occurrence by reason of Force Majeure, then the Party unable to carry out its responsibility shall give the other Party notice and full particulars of such Force Majeure in writing within a reasonable time after the occurrence of the event, and such notice shall suspend the Party's responsibility for the continuance of the Force Majeure claimed, but for no longer period.

Force Majeure means acts of God, floods, hurricanes, tropical storms, tornadoes, earthquakes, or other natural disasters, acts of a public enemy, acts of terrorism, sovereign conduct, riots, civil commotion, strikes or lockouts, and other causes that are not occasioned by either Party's conduct which by the exercise of due diligence the Party is unable to overcome, and which substantially interferes with operations.

28. ESTIMATED QUANTITIES

Any reference to quantities shown in the request for Proposal is an estimate only. Since the exact quantities cannot be predetermined, the County reserves the right to adjust quantities as deemed necessary to meet its requirements.

29. CONTRACTOR INVESTIGATION

Before submitting a Proposal, each Proposer shall make all investigations and examinations necessary to ascertain all site conditions and requirements affecting the full performance of the contract and to verify any representations made by the County upon which the contractor will rely. Proposer shall exercise due diligence and is further charged with knowledge of the local, State, and Federal laws, rules, and regulations applicable to this contract. If the Proposer receives an award as a result of its Proposal submission in this procurement, the Proposer's failure to have made such investigations and examinations will in no way relieve the Proposer from its obligation to comply in every detail with all provisions and requirements of the contract, nor will a plea of ignorance of such conditions and requirements be accepted as a basis for any claim whatsoever by the contractor for additional compensation and/or for excused nonperformance.

30. NO COMMITMENT BY COUNTY OF GALVESTON

This request for procurement does not commit the County of Galveston to award any costs or pay any costs, or to award any contract, or to pay any costs associated with or incurred in the preparation of a Proposal in response to this request for Proposal and does not commit the County of Galveston to procure or contract for services or supplies.

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31. PROPOSAL COSTS BORNE BY PROPOSER

Galveston County shall not be liable for any costs incurred by Proposer in preparation, production, or submission of a Proposal, including but not limited to best and final offer if applicable. As well, Galveston County shall not be liable for any work performed by Proposer prior to issuance of fully executed contract and properly issued notice to proceed. Galveston County shall not be liable for any costs incurred by Proposer by reason of attending a pre-Proposal conference. Galveston County shall not be liable for any costs incurred by Proposer by reason of the County invoking use of best and final offers.

32. BEST AND FINAL OFFERS (BAFO)

In acceptance of Proposals, the County reserves the right to negotiate further with one or more of the Proposers as to any features of their Proposals and to accept modifications of the work and price when such action will be in the best interest of the County. This includes, but is not limited to, the solicitation of a Best and Final Offer from one or more of the Proposers. If a Best and Final Offer is invoked, this allows acceptable Proposers the opportunity to amend, change, or supplement their original Proposal. Proposers may be contacted in writing by the Purchasing Agent, requesting that they submit their Best and Final Offer. Any such Best and Final Offer must include discussed and negotiated changes.

33. SINGLE PROPOSAL RESPONSE

If only one Proposal is received in response to the request for Proposal, a detailed cost Proposal may be requested of the single Proposer. A cost/price analysis and evaluation and/or audit may be performed of the cost Proposal to determine if the price is fair and reasonable.

34. CHANGES IN SPECIFICATIONS

If it becomes necessary to revise any part of this Request for Proposal, a written notice of such revision will be provided to all Proposers in the form of addenda. The County is not bound by any oral representations, clarifications, or changes made in the written specifications by the County's employees or officials, unless such clarification or change is provided to Proposers in a written addendum from the Purchasing Agent. Proposers are advised to inquire prior to the submission deadline as to whether any addenda to this request for Proposal have been issued, as the successful Proposer will be required to abide by such addenda.

The County of Galveston reserves the right to revise or amend the specifications up to the time set for opening of Proposals. Such revisions and amendments, if any, shall be announced by form of addenda. Copies of such addenda (or addendum in the event only one addendum is issued in the procurement) shall be furnished to all prospective contractors. Prospective contractors are defined as those contractors listed on the County's request for proposal list for this material/service or those who have obtained documents from the Purchasing Agent's Office subsequent to the advertisement. If revisions and amendments require changes in quantities or prices proposed, or both, the date set for opening of Proposals may be postponed by such number of days as in the opinion of the County shall enable prospective contractors to revise their Proposals. In any case, the Proposal opening shall be at least seven (7) business days after the last revising or amendment addendum and the addendum shall include an announcement of the new date, if applicable, for the opening of Proposals.

35. PROPOSAL IDEAS AND CONCEPTS

The County reserves to itself the right to adopt or use for its benefit, any concept, plan, or idea contained in any Proposal.

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36. PROPOSAL DISCLOSURES

While this procurement is pending, the names of those who submitted Proposals will not be made public unless in conformity with the County Purchasing Act. Likewise, no pricing, staffing, or other contents of the Proposal information will be released unless in conformity with the County Purchasing Act. Proposers are requested to withhold all inquiries regarding their Proposal or other submissions until after an award is made. No communication is to be had with any County employee or official, other than the County Purchasing Agent, regarding whether a Proposal was received - violations of this provision may result in the rejection of a Proposal.

37. INDEMNIFICATION

The contractor agrees to assume all risks and responsibility for, and agrees to indemnify, defend, and save harmless, the County of Galveston, its elected and appointed officials and department heads, and its agents and employees from and against all claims, demands, suits, actions, recoveries, judgments, and costs and expenses including reasonable attorney's fees for the defense thereof, arising out of or in connection therewith on account of the loss of life, property or injury or damage to the person which shall arise from contractor's operations under this contract, its use of County facilities and/or equipment or from any other breach on the part of the contractor, its employees, agents or any person(s), in or about the County's facilities with the expressed or implied consent of the County. Contractor shall pay any judgment with cost which may be obtained against Galveston County resulting from contractor's operations under this contract.

Contractor agrees to indemnify and hold the County harmless from all claims of subcontractors, laborers incurred in the performance of this contract. Contractor shall furnish satisfactory evidence that all obligations of this nature herein above designated have been paid, discharged or waived. If Contractor fails to do so, then the County reserves the right to pay unpaid bills of which County has written notice direct and withhold from Contractor's unpaid compensation a sum of money reasonably sufficient to liquidate any and all such lawful claims.

38. REQUIREMENT OF AND PROOF OF INSURANCE

The successful Proposer shall furnish evidence of insurance to the County Purchasing Agent and shall maintain such insurance as required hereunder or as may be required in the Special Provisions or resultant contract, if different. Contractor shall obtain and thereafter continuously maintain in full force and effect, Commercial General Liability insurance, including but not limited to bodily injury, property damage, and contractual liability, with combined single limits as listed below or as may be required by State or Federal law, whichever is greater.

- A. For damages arising out of bodily injury to or death of one person in any one accident:
ONE HUNDRED THOUSAND AND NO/100 (\$100,000.00) DOLLARS.
- B. For damages arising out of bodily injury to or death of two or more persons in any one accident:
THREE HUNDRED THOUSAND AND NO/100 (\$300,000.00) DOLLARS.
- C. For any injury to or destruction of property in any one accident:
ONE HUNDRED THOUSAND AND NO/100 (\$100,000.00) DOLLARS.

Insurance shall be placed with insurers having an A.M. Best's rating of no less than A. Such insurance must be issued by a casualty company authorized to do business in the State of Texas, and in

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standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions ensuring the public from loss or damage that may arise to any person or property by reason of services rendered by Contractor.

Galveston County shall be listed as the additional insured on policy certificates and shall be provided with no less than thirty (30) calendar days prior notice of any changes to the policy during the contractual period.

Certificates of Insurance, fully executed by a licensed representative of the insurance company written or countersigned by an authorized Texas state agency, shall be filed with the County Purchasing Agent within ten (10) business days of issuance of notification from the County Purchasing Agent to Proposer that the contract is being activated as written proof of such insurance and further provided that Proposer shall not commence work under this contract until it has obtained all insurance required herein, provided written proof as required herein, and received written notice to proceed issued from the County Purchasing Agent.

Proof of renewal/replacement coverage shall be provided prior to the expiration, termination, or cancellation date of any policy and Galveston County shall be named as an additional insured on any such renewal/replacement coverage and a certificate of insurance showing such shall be provided to the Purchasing Agent. Said insurance shall not be cancelled, permitted to expire, or changed without at least thirty (30) days prior written notice to the County.

Insurance required herein shall be maintained in full force and effect during the life of this contract and shall be issued on an occurrence basis. Contractor shall require that any and all subcontractors that are not protected under the Contractor's own insurance policies take and maintain insurance of the same nature and in the same amounts as required of Contractor and provide written proof of such insurance to Contractor. Proof of renewed/replacement coverage shall be provided prior to the expiration, termination, or cancellation date of any policy. Contractor shall not allow any subcontractor to commence work on the subcontract until such insurance required for the subcontractor has been obtained and approved.

Workers' Compensation Insurance: Successful Proposer shall carry in full force Workers' Compensation Insurance Policy(ies), if there is more than one employee, for all its' employees, including but not limited to full time, part time, and emergency employees employed by the successful Proposer. Current insurance certificates certifying that such policies as specified above are in full force and effect shall be furnished by successful Proposer to the County.

Insurance is to be placed with insurers having a Best rating of no less than A. The Proposer shall furnish the County with certificates of insurance and original endorsements affecting coverage required by these insurance clauses within ten (10) business days of receiving notification from the County Purchasing Agent that the contract is being activated. The certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf. The Proposer shall be required to submit annual renewals for the term of this contract prior to expiration of any policy.

In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

The County agrees to provide Proposer with reasonable and timely notice of any claim, demand, or cause of action made or brought against the County arising out of or related to utilization of the property. Proposer shall have the right to defend any such claim, demand, or cause of action at its sole cost and expense and within its sole and exclusive discretion. The County agrees not to compromise or settle any

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claim or cause of action arising out of or related to the utilization of the property without the prior written consent of the Proposer.

In no event shall the County be liable for any damage to or destruction of any property belonging to the Proposer.

Subrogation Waiver. Proposer and Proposer's insurance carrier waive any and all rights to subrogation against Galveston County in regard to any suit or claim arising out of personal injury or property damage resulting from Proposer's performance under this agreement.

39. PROPOSAL GUARANTEE

Unless specified differently within the Special Provisions of this procurement, each Proposer shall be required to submit a Proposal guarantee with its Proposal as required within this Section.

Evidencing its firm commitment to engage in contract if Proposer is selected for award of contract, each Proposer is required to furnish with their Proposal a cashier's check or an acceptable Proposer's bond (generally, a Proposal bond) in the amount of five percent (5%) of the total contract price. If Proposer is using a bond, then the bond must be executed with a surety company authorized to do business in the State of Texas. Failure to furnish the Proposal guarantee in the proper form and amount, by the time set for opening of Proposals may be cause for rejection of the Proposal.

The cashier's check or Proposer bond (as applicable) will be returned to each respective unsuccessful Proposer(s) after the Commissioners' Court award of contract and shall be returned to the successful Proposer upon the completion and submission of all contract documents. Provided however, that the cashier's check or Proposer bond will be forfeited to the County as liquidated damages should successful Proposer fail to execute the contract within thirty (30) days after receiving notice of the acceptance of its Proposal.

40. PERFORMANCE AND PAYMENT BONDS (if required)

Successful Proposer, before beginning work, shall execute a performance bond and a payment bond, each of which must be in the amount of the contract. The required payment and performance bonds must each be executed by a corporate surety authorized to write surety bonds in the State of Texas and in accordance with Chapter 3503 of the Insurance Code (codified in 2005 and originally within Section 1, Chapter 87, Acts of the 56th Leg., R.S., 1959, and in Article 7.19-1, Vernon's Texas Insurance Code).

The performance and payment bonds must each clearly and prominently display on the bond or on an attachment to the bond:

- a.) The name, mailing address, physical address, and telephone number, including the area code, of the surety company to which any notice of claim should be sent; or
- b.) The toll-free telephone number maintained by the Texas Department of Insurance under Subchapter B, Chapter 521, Insurance Code, and a statement that the address of the surety company to which any notice of claim should be sent may be obtained from the Texas Department of Insurance by calling the toll free-telephone number.

The performance bond shall be solely for the protection of Galveston County, in the full amount of the

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contract, and conditioned on the faithful performance of the work in accordance with the plans, specifications, and contract documents. The payment bond is solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the prime contractor or a subcontractor to supply labor or material, and in the amount of the contract.

The payment and performance bonds required to be furnished herein must be furnished before the contractor begins work and are a requirement for issuance of a Notice to Proceed. Such bonds must be furnished to the Galveston County Purchasing Agent within thirty (30) calendar days after the date of the full execution of the contract or, if applicable, as required under Chapter 2253, Government Code, whichever is earlier. Contractor's failure to provide the required payment and performance bonds within such time period shall constitute an event of default under this contract. Contractor shall not commence work until all applicable certificates of insurance, performance bonds, and payment bonds have been received and approved by the County Purchasing Agent and the Contractor receives notice to proceed in writing that has been issued by the County Purchasing Agent.

Additionally, if this request for Proposal is for the award of a public works contract, then compliance with Chapter 2253 of the Texas Government Code, which is known as the McGregor Act, is mandatory. Performance and payment bonds are required to be furnished in accordance with Chapter 2253 of the Texas Government Code. Proposer should familiarize itself with the entire provisions of Chapter 2253 of the Texas Government Code.

41. PATENT AND COPYRIGHT PROTECTION

The Proposer agrees at its sole expense to protect the County from claims involving infringement of patents, copyright, trademark, trade secret, or other intellectual property rights. **Proposer shall indemnify and save harmless the County of Galveston, its officers, employees, and agents, from liability of any nature and kind whatsoever, including without limitation cost and expenses, for or on account of any copyrighted, trademarked, trade secret, patented or un-patented invention, process, or article manufactured or used in the performance of the contract, or other intellectual property rights, including its use by the County.** Proposer also agrees that if Proposer is awarded this contract, that no work performed hereunder shall be subject to patent, copyright, or other intellectual property by Proposer.

42. CONFLICT OF INTEREST DISCLOSURE REPORTING (FORM CIQ)

Proposer may be required under Chapter 176 of the Texas Local Government Code to complete and file a Conflict-of-Interest Questionnaire (CIQ Form). The CIQ Form pertains to business relationship, gift giving and family relationship reporting. If Proposer is required to file a CIQ Form, then **the completed CIQ Form must be filed with the County Clerk of Galveston County, Texas.**

Business relationship. If Proposer has an employment or other business relationship with a local government officer of Galveston County or with a family member of a local government officer of Galveston County that results in the officer or family member of the officer receiving taxable income that exceeds \$2,500.00 during the preceding 12-month period, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

Gift-giving. If Proposer has given a local government officer of Galveston County or a family member of a local government officer of Galveston County one or more gifts with an aggregate value of more than

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one-hundred dollars (\$100.00) during the preceding 12-months, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

Family member. For purposes of the business relationship and gift giving reporting requirements, a “family member” means a person related to another person with the first degree of consanguinity or affinity, as described by Subchapter B, Chapter 573, Texas Government Code. Examples of persons within the first degree by consanguinity or affinity include a son, daughter, father, mother, spouse, son-in-law, daughter-in-law, father-in-law, mother-in-law, stepson, stepdaughter, stepmother, and stepfather.

Family relationship. If Proposer has a “family relationship” with a local government officer of Galveston County then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County, regardless of whether Proposer has a business relationship or has given gifts to the local government officer or a family member of the local government officer. For this purpose, “family relationship” means Proposer is related within the third degree by consanguinity or the second degree by affinity, as those terms are defined under Chapter 573 of the Texas Government Code, to a local government officer of Galveston County. Examples of such relationships include a son, daughter, mother, father, brother, sister, grandchild, great-grandchild, grandparent, great-grandparent, niece, nephew, uncle, aunt, spouse, mother-in-law, father-in-law, daughter-in-law, son-in-law, spouse’s grandchild, spouse’s grandparent, grandparent’s spouse, grandchild’s spouse, stepson, stepdaughter, stepmother, and stepfather.

Proposer must file its original CIQ Form with the Galveston County Clerk. The Galveston County Clerk has offices at the following locations:

Galveston County Clerk
Galveston County Justice Center, Suite 2001
600 59th Street
Galveston, Texas 77551

Galveston County Clerk
North County Annex, 1st Floor
174 Calder Road
League City, Texas 77573

Again, if Proposer is required to file a CIQ Form, the original completed form is filed with the Galveston County Clerk (**not the Purchasing Agent**).

For Proposer’s convenience, a blank CIQ Form is enclosed with this Proposal package. Blank CIQ Form(s) may also be obtained by visiting the Purchasing Agent’s website. This website is linked from the Galveston County homepage, at <http://www.galvestoncountytexas.gov>.

Chapter 176 specifies deadlines for the filing of CIQ Forms (both initial filings and updated filings).

It is Proposer’s sole responsibility to file a true and complete CIQ Form with the Galveston County Clerk if Proposer is required to file by the requirements of Chapter 176 of the Local Government Code. Proposer is advised that it is an offense to fail to comply with the disclosure reporting requirements dictated under Chapter 176 of the Texas Local Government Code, and the failure to file may be grounds to void the contract, if Proposer is awarded a contract.

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If Proposer has any questions about compliance with Chapter 176, Proposer may wish to consult its' legal counsel. Compliance is the individual responsibility of each person, business, and agent who is subject to Chapter 176 of the Texas Local Government Code.

43. DISCLOSURE OF INTERESTED PARTIES / FORM 1295

Under Section 2252.908 of the Government Code, any business entity that enters into a contract with Galveston County that requires the approval of the Commissioners' Court must submit a "Disclosure of Interested Parties" to the County prior to the execution of the contract. This form, the "Disclosure of Interested Parties" form was promulgated by the Texas Ethics Commission and is the "Form 1295". **This procurement is subject to these requirements.**

The Texas Ethics Commission was charged with promulgating rules to implement Section 2252.908 of the Government Code. The rules adopted by the Texas Ethics Commission are located at Sections 46.1, 46.3, and 46.5 of Title 1 of the Texas Administrative Code. Thus, the law covering these requirements is located at Section 2252.908 of the Government Code, and in Title 1, Sections 46.1, 46.3, and 46.5 of the Texas Administrative Code.

The Texas Ethics Commission's website is: www.ethics.state.tx.us. The area of the Texas Ethics Commission website pertaining to Form 1295 is:

www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm.

Form 1295 must be completed electronically through the Texas Ethics Commission website (handwritten forms are not allowable). Once the business entity has completed their electronic filing of Form 1295, then the business entity must print out the electronically completed form, and sign and notarize the Form 1295. Once Form 1295 is signed and notarized, the business entity must submit their completed, signed, and notarized Form 1295 to the Galveston County Purchasing Agent.

Successful Proposer is and shall be subject to these requirements, and no resultant contract may be executed by the Commissioners' Court until the completed, signed, and notarized Form 1295 is on file with the County Purchasing Agent.

No portion of the Form 1295 process commits the County to any type of award of contract whatsoever.

After the Purchasing Agent's Office receives the completed, signed, and notarized Form 1295, the Purchasing Department representative will, within 30 days, go to the Texas Ethics Commission website to submit electronic confirmation of the County's receipt of the completed, signed, and notarized Form 1295.

44. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS & REQUIREMENT TO REGISTER IN SAM

Proposer certifies that neither it, nor any of its Principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. Contractor agrees that it shall refund Galveston County for any payments made to Contractor while ineligible. Contractor acknowledges that Contractor's uncured failure to perform under this Agreement, if such should occur, may result in Contractor being debarred from performing additional work for the County, the respecting State Agency administering the grant funding the contract, if

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applicable, the State, FEMA, or HUD (as applicable), and other Federal and State entities. Further, Proposer has executed the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters and returned the fully completed and executed original certification with the submission of its Proposal.

The truthful and fully completed and executed original of the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters must be included with the submission of Proposer's Proposal and is a mandatory requirement of this request for Proposal. Proposer's failure to include the fully completed and executed original of this Certification shall be considered non-compliance with the requirements of this request for Proposal and grounds for the rejection of Proposer's Proposal.

Proposer shall immediately notify the County Purchasing Agent if it becomes debarred or suspended, placed on the Consolidated List of Debarred Contractors, or in any other way becomes ineligible for award of contract by any Federal agency. This Certification is a material fact relied upon by Galveston County; if it is later determined that the contractor did not comply with 2 C.F.R. Part 180 and 2 C.F.R. Part 3000, in addition to the remedies available to Galveston County and the State agency administering this grant, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment of contractor.

If the contract to be awarded pursuant to this procurement involves the use of Federal funds, then Proposer must also be registered in the Federal Contractor Registry through the System for Award Management (SAM) to be eligible for award of contract pursuant to this procurement.

Information regarding the SAM is available at:

<http://www.federalcontractorregistry.com/?gclid=CIG1hf2rr8wCFYkCaQoducANZw> or at
<https://www.sam.gov/portal/SAM/#1>.

No contract involving the use of Federal funds may be awarded to any Proposer unless and until such registration is current and in good standing under SAM. If this contract involves the use of Federal funds, then Proposer must enclose proof of such SAM registration within its response, which is also a mandatory requirement of this procurement; failure to enclose such proof shall be considered non-compliance with the requirements of this procurement and grounds for the rejection of Proposer's response to this procurement (i.e., Proposal, Proposal, or qualifications statement, as applicable).

45. TRANSACTIONS WITH TERRORIST ORGANIZATIONS PROHIBITED

(Texas Government Code 2252.151; 2252.152) Prohibition on contracts with certain companies per Government Code 2252.151 Definitions:

(1)“**Company**” has the meaning assigned by Section 806.001.

(2)“**Foreign terrorist organization**” means an organization designated as a foreign terrorist organization by the United States secretary of state as authorized by 8 U.S.C. Section 1189.

(3)“**Governmental contract**” means a contract awarded by a governmental entity for general construction, an improvement, a service, or a public works project for a purchase of supplies, materials, or equipment.

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The term includes a contract to obtain a professional or consulting service subject to Government Code, Chapter 2254.

(4) **"Governmental entity"** has the meaning assigned by Government Code, Section 2252.001.

Pursuant to Chapter 2252, Texas Government Code, Contractor shall certify that, at the time of execution of this Contract, neither the Contractor, nor any wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of the same (1) engages in business with Iran, Sudan, or any foreign terrorist organization as described in Chapters 806 or 807 of the Texas Government Code, or Subchapter F of Chapter 2252 of the Texas Government Code, or (2) is a company listed by the Texas Comptroller of Public Accounts under Sections 806.051, 807.051, or 2252.153 of the Texas Government Code.

46. VERIFICATION NOT TO BOYCOTT ISRAEL

Prohibition on contracts with companies boycotting Israel per Government Code 2271.001 Definitions:

(1) **"Boycott Israel"** has the meaning assigned by Section 808.001.

(2) **"Company"** has the meaning assigned by Section 808.001; except that the term does not include a sole proprietorship.

(2) **"Governmental entity"** has the meaning assigned by Government Code, Section 2251.001.

PROVISION REQUIRED IN CONTRACT. (a) This section applies only to a contract that:

(1) is between a governmental entity and a company with 10 or more full-time employees; and

(2) has a value of \$100,000 or more that is to be paid wholly or partly from public funds of the governmental entity.

(b) A governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it:

(1) does not boycott Israel; and

(2) will not boycott Israel during the term of the contract.

As required by GOVERNMENT CODE, CHAPTER 2271, **CONTRACTOR hereby verifies that it does not boycott Israel and will not boycott Israel throughout the term of this Agreement.** For the purposes of this verification, "Boycott Israel" means refusing to deal with, terminating business activities, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

47. SOVEREIGN IMMUNITY

The County specifically reserves any claim it may have to sovereign, qualified, or official immunity as a defense to any action arising in conjunction with this contract.

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48. CONTROLLING LAW AND VENUE

Proposer acknowledges and agrees that the contract is and shall be governed and construed by the laws of the State of Texas and that venue shall lie exclusively in a court of competent jurisdiction in Galveston County, Texas.

49. MERGERS, ACQUISITIONS

The Proposer shall be required to notify the County of any potential for merger or acquisition of which there is knowledge at the time that a Proposal is submitted.

If subsequent to the award of any contract resulting from this request for Proposal the Proposer shall merge or be acquired by another firm, the following documents must be submitted to the County:

- A. Corporate resolutions prepared by the awarded Proposer and the new entity ratifying acceptance of the original contract, terms, conditions and prices;
- B. New entity's Federal Identification Number (FEIN);
- C. New entity's proposed operating plans;
- D. New entity's proof of registration in SAM for contracts involving Federal funds;
- E. New entity's certification regarding debarment;
- F. New entity's certification regarding lobbying; and
- G. W-9 Form for new entity

Moreover, Proposer is required to provide the County with notice of any anticipated merger or acquisition as soon as Proposer has actual knowledge of the anticipated merger or acquisition. The New Proposer's proposed plan of operation must be submitted prior to merger to allow time for submission of such plan to the Commissioners' Court for its approval.

50. DELAYS

The County reserves the right to delay the scheduled commencement date of the contract if it is to the advantage of the County. There shall be no additional costs attributed to these delays should any occur. Proposer agrees it will make no claims for damages, for damages for lost revenues, for damages caused by breach of contract with third parties, or any other claim by Proposer attributed to these delays, should any occur. In addition, Proposer agrees that any contract it enters into with any third party in anticipation of the commencement of the contract will contain a statement that the third party will similarly make no claim for damages based on delay of the scheduled commencement date of the contract.

51. ACCURACY OF DATA

Information and data provided through this request for Proposal are believed to be reasonably accurate.

52. SUBCONTRACTING/ASSIGNMENT

Proposer shall not assign, sell, or otherwise transfer its contract in whole or in part without prior written permission of the County acting by and through its Commissioners' Court. Such consent, if granted, shall not relieve the Proposer of any of its responsibilities under this contract.

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53. INDEPENDENT CONTRACTOR

Proposer expressly acknowledges that it is an independent contractor. Nothing in this agreement is intended nor shall be construed to create an agency relationship, an employer/employee relationship, a joint venture relationship, or any other relationship allowing County to exercise control or direction over the manner or method by which Proposer or Proposer's subcontractors perform in providing the requirements stated in the request for Proposal.

54. MONITORING PERFORMANCE

The County shall have the unfettered right to monitor and audit the Proposer's work in every respect. In this regard, the Proposer shall provide its full cooperation and ensure the cooperation of its employees, agents, assigns, and subcontractors. Further, the Proposer shall make available for inspection and/or copying when requested, original data, records, and accounts relating to the Proposer's work and performance under this contract. In the event any such material is not held by the Proposer in its original form, a true copy shall be provided.

55. SUBJECT TO APPROPRIATION OF FUNDS

State law prohibits the obligation and expenditure of public funds beyond the fiscal year for which a budget has been approved by the Commissioners' Court. Galveston County anticipates this to be an integral part of future budgets to be approved during the periods of this contract, except for unanticipated needs or events which may prevent such payments against this contract. However, Galveston County cannot guarantee the availability of funds, and enters into this contract only to the extent such funds are made available through appropriation (allocation) by the Commissioners' Court. This contract shall not be construed as creating any debt on behalf of the County of Galveston in violation of TEX. CONST. art. XI, § 7, and it is understood that all obligations of Galveston County are subject to the availability of funds.

56. CONTRACTS SUBJECT TO GRANT FUNDING

Notwithstanding the foregoing, if the contract to be awarded by this procurement is funded with Federal or State grant funds, the Proposer acknowledges that the obligations of the County under the contract are contingent upon the continued availability of grant funding to meet the County's obligations. If the grant(s) to the County is reduced, de-obligated, or otherwise discontinued or terminated, Contractor agrees that the County may immediately terminate the contract without penalty or any liability whatsoever on the part of the County, the State, or the Federal awarding agency.

57. PROCUREMENT ETHICS

Galveston County is committed to the highest ethical standards. Therefore, it is a serious breach of the public trust to subvert the public purchasing process by directing purchases to certain favored vendors, or to tamper with the competitive Proposal process, whether it's done for kickbacks, friendship or any other reason. Since misuse of the purchasing power of a local government carries criminal penalties, and many such misuses are from a lack of clear guidelines about what constitutes an abuse of office, the Code of Ethics outlined below must be strictly followed.

Galveston County also requires ethical conduct from those who do business with the County.

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CODE OF ETHICS – Statement of Purchasing Policy:

Public employment is a public trust. It is the policy of Galveston County to promote and balance the objective of protecting the County's integrity and the objective of facilitating the recruitment and retention of personnel needed by Galveston County. Such policy is implemented by prescribing essential standards of ethical conduct without creating unnecessary obstacles to entering public office.

Public employees must discharge their duties impartially so as to assure fair competitive access to governmental procurement by responsible contractors. Moreover, they should conduct themselves in such a manner as to foster public confidence in the integrity of the Galveston County procurement organization. To achieve the purpose of this Article, it is essential that those doing business with Galveston County also observe the ethical standards prescribed herein.

General Ethical Standards:

It shall be a breach of ethics to attempt to realize personal gain through public employment with Galveston County by any conduct inconsistent with the proper discharge of the employee's duties.

It shall be a breach of ethics to attempt to influence any public employee of Galveston County to breach the standards of ethical conduct set forth in this code.

It shall be a breach of ethics for any employee of Galveston County to participate directly or indirectly in a procurement when the employee knows that:

- The employee or any member of the employee's family, has a financial interest pertaining to the procurement;
- A business or organization in which the employee or any member of the employee's family, has a financial interest pertaining to the procurement; or
- Any other person, business, or organization with which the employee or any member of the employee's family is negotiating or has an arrangement concerning prospective employment is involved in the procurement.

Gratuities:

It shall be a breach of ethics for any person to offer, give, or agree to give any employee or former employee of Galveston County, or for any employee or former employee of Galveston County to solicit, demand, accept or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation of any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or Proposal pending before this government.

Kickbacks:

It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for Galveston County, or to any person associated therewith, as an inducement for the award of a contract, subcontract or order.

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Contract Clause:

The prohibition against gratuities and kickbacks prescribed above shall be conspicuously set forth in every contract and solicitation by Galveston County.

Confidential Information:

It shall be a breach of ethics for any employee or former employee of Galveston County to knowingly use confidential information for actual or anticipated personal gain, or for the actual or anticipated gain of any other person.

Prohibition against Contingent Fees:

It shall be a breach of ethical standards for a person to be retained, or to retain a person, to solicit or secure a Galveston County contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies for the purpose of securing business. Failure to abide by this section constitutes a breach of ethical standards.

Representation:

Proposer represents and warrants, by signing and submitting its Proposal, that it has not retained anyone in violation of this section prohibiting contingent fees.

Contract Clause:

The representation prescribed above shall be conspicuously set forth in every contract and solicitation thereof.

58. NON-COLLUSION AFFIDAVIT

Proposer certifies, by signing and submitting a Proposal, that the Proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Proposal is genuine and not collusive or sham; that the contractor has not directly or indirectly induced or solicited another contractor to put in a false or sham Proposal, and has not directly or indirectly colluded, conspired, connived, or agreed with any contractor or anyone else to put in a sham Proposal or that anyone shall refrain from proposing; that the contractor has not in any manner, directly or indirectly, sought by agreement, communications, or conference with anyone to fix the Proposal price of the contractor of any other Proposer, or to fix any overhead, profit or cost element of the Proposal price, or that of any other contractor, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in the Proposal are true; and further, that the contractor has not, directly or indirectly, submitted his or her Proposal price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any cooperation, partnership, company association, organization, Proposal depository, or to any member or agent thereof to effectuate a collusive or sham Proposal.

A blank Non-Collusion Affidavit is included with this Proposal packet. Proposer must enclose a truthful and fully executed original Non-Collusion Affidavit with the submission of its Proposal. This is a mandatory requirement of this request for Proposal. Failure to include the truthfully and fully executed Non-Collusion Affidavit in the submission of its Proposal shall be considered non-compliance with the requirements of this request for Proposal by the Proposer and grounds for the rejection of Proposer's submission.

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No negotiations, decisions, or actions shall be initiated by any company as a result of any verbal discussion with any County employee prior to the opening of responses to this request for Proposal.

No officer or employee of the County of Galveston, and no other public or elected official, or employee, who may exercise any function or responsibilities in the review or approval of this undertaking shall have any personal or financial interest, direct or indirect, in any contract or negotiation process thereof. The above compliance request will be part of all County of Galveston contracts for this service.

59. CERTIFICATION REGARDING LOBBYING – COMPLIANT WITH APPENDIX A TO 24 C.F.R. PART 871

Proposer certifies that, to the best of his or her knowledge and belief, that:

- a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the Proposer, to any person for influencing or attempting to influence a department or employee of an agency, a member of Congress, or an employee of a member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.
- b. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence a department or employee of any agency, a member of Congress, a department or employee of congress, or an employee of a member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, **the Proposer shall complete and submit Standard Form LLL, “Disclosure Form to Report Lobbying”, in accordance with its instructions.**
- c. Proposer shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of the certification is a prerequisite for making or entering into a contract with Proposer and is imposed by Section 1352, Title 31, United States Code. Further, any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The truthful and fully completed and executed original of the Certification Regarding Lobbying (included with Proposal packet) must be included with the submission of Proposer’s Proposal and is a mandatory requirement of this request for Proposal. Proposer’s failure to include the fully completed and executed or original of this Certification shall be considered non-compliant with the requirements of this request for Proposal and grounds for the rejection of the Proposer’s Proposal.

60. NON-DISCRIMINATION

- a. **Equal Employment Opportunity:** Proposer will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, genetic information or veteran status. Proposer will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, national origin, sex, disability,

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genetic information or veteran status. Such action shall include, but not be limited to, the following: employment; upgrading; demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Proposer agrees to post in conspicuous places, available to employees and applicants for employment, notices of employment.

Proposer will, in all solicitation or advertisements for employees placed by or on behalf of Proposer, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, sex, disability, genetic information, or veteran status. Proposer will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Agreement so that such provisions will be binding upon each subcontractor, provided that the foregoing provisions shall not apply to contracts or subcontracts for standard commercial supplies or raw materials.

Proposer will include the provisions herein in every subcontract or purchase order unless exempted.

- b. Drug Free Work Place Act: Proposer shall comply with all applicable requirements of the Drug-Free Workplace Act of 1988 (Public Law 100-690, Title V, Subtitle D; 41 U.S.C. § 8102, et seq.) and implementing regulations thereunder.
- c. Americans with Disabilities Act: Proposer shall comply with all applicable provisions of the Americans with Disabilities Act of 1990 (Public Law 101-136) and implementing regulations thereunder.
- d. OSHA Regulations: Proposer agrees to maintain and to display any applicable materials for its employees in accordance with OSHA regulations.
- e. Compliance with Immigration Laws and Use of E-Verify: Proposer agrees to comply with all requirements of the U.S. Immigration Reform and Control Act of 1986, as amended, and any implementing regulations thereto. Proposer further agrees to utilize the E-Verify system through the Department of Homeland Security on its employees. Proposer shall not employ unauthorized aliens and shall not assign services to be performed to any supplier or subcontractor who are unauthorized aliens. If any personnel performing any services hereunder are discovered to be an unauthorized alien, then Proposer will immediately remove such personnel from performing services hereunder and shall replace such personnel with personnel who are not unauthorized alien(s).
- f. State and Federal Law Compliance: Proposer agrees to comply with all other State and Federal laws and regulations applicable to the provision of services under this contract.
- g. The Contractor shall comply with the Age Discrimination Act of 1975 which provides that no person in the United States shall on the basis of age be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

61. RECORD RETENTION AND RIGHT TO AUDIT

Proposer shall keep and maintain all records associated with this contract for a minimum of five (5) years from the close of the contract or as required by Federal or State law or regulation, whichever period is longer. If awarded this contract, Proposer shall allow the County reasonable access to the records in Proposer's possession, custody, or control that the County deems necessary to assist it in auditing the services, costs, and payments provided hereunder. If this contract involves the use of Federal or State funds, then Proposer shall also allow reasonable access to representatives of the Office of Inspector

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General, the General Accounting Office, the State Auditor's Office, and the other Federal and/or State agencies overseeing the funds that such entities deem necessary to facilitate review by such agencies and Proposer shall maintain fiscal records and supporting documentation for all expenditures in a manner that conforms with OMB Circular A-87 (relocated to 2 C.F.R. Part 225) and this contract.

62. TITLE VI ASSURANCES/TxDOT

The County is subject to Title VI of the Civil Rights Act of 1964 and the Federal and State laws and regulations of the United States Department of Transportation and Texas Department of Transportation (TxDOT).

Pursuant to these requirements, the County must have its contractors provide required assurances on compliance with non-discrimination by itself and its subcontractors. The Title VI Assurances within this Subsection are not exhaustive – whenever any Federal, State, or Local requirement requires additional clauses, this list shall not be construed as limiting. Contractor agrees as follows:

- (1) **Compliance with Regulations:** The Contractor shall comply with the Regulations relative to nondiscrimination in Federally assisted programs of the Department of Transportation (hereinafter, DOT) Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are incorporated herein by reference and made a part of this contract.
- (2) **Non-discrimination:** The Contractor, with regard to the work performed by it during the contract, shall not discriminate on the basis of race, color, national origin, religion, sex, age, disability or Veteran status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
- (3) **Solicitations for Subcontractors, Including Procurement of Materials and Equipment:** In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurement of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, national origin, religion, sex, age, disability or Veteran status.
- (4) **Information and Reports:** The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the Galveston County or the Texas Department of Transportation to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of the Contractor is in the exclusive possession of another who fails or refuses to furnish this information the Contractor shall so certify to Galveston County or the Texas Department of Transportation as appropriate and shall set forth what efforts it has made to obtain the information.
- (5) **Sanctions for Non-compliance:** In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, Galveston County shall impose such contract sanctions as it or the Texas Department of Transportation may determine to be appropriate, including, but not limited to:

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- (a) withholding of payments to the Contractor under the contract until the Contractor complies, and/or;
- (b) cancellation, termination, or suspension of the contract, in whole or in part.

(6) Incorporation of Provisions. The Contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as Galveston County or the Texas Department of Transportation may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request Galveston County to enter into such litigation to protect the interests of Galveston County, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

63. ASSURANCES FOR CONSTRUCTION PROGRAMS - TEXAS GENERAL LAND OFFICE (GLO)

The County is subject to Federal and State laws and regulations of the United States and The Texas General Land Office (GLO). Pursuant to these requirements, the County must have its contractors provide required assurances on compliance with non-discrimination by itself and its subcontractors. These Assurances within this Subsection are not exhaustive – whenever any Federal, State, or Local requirement requires additional clauses, this list shall not be construed as limiting. Contractor agrees as follows:

- (1) Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
- (2) Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
- (3) Will comply with all Federal statutes relating to non-discrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of

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alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other non-discrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

- (4) Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
- (5) Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
- (6) Will comply with all Federal statutes relating to non-discrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other non-discrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
- (7) Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal and federally assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
- (8) Will comply with the provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

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- (9) Will comply, as applicable, with the provisions of the Davis- Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333) regarding labor standards for federally assisted construction sub agreements.
- (10) Will comply with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
- (11) Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93205).
- (12) Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
- (13) Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
- (14) Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
- (15) Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.
- (16) Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

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64. GENERAL AFFIRMATIONS – TEXAS GENERAL LAND OFFICE (GLO)

To the extent they apply, affirms, and agrees to the following, without exception:

1. represents and warrants that, in accordance with Section 2155.005 of the Texas Government Code, neither nor the firm, corporation, partnership, or institution represented by , or anyone acting for such a firm, corporation, partnership, or institution has (1) violated any provision of the Texas Free Enterprise and Antitrust Act of 1983, Chapter 15 of the Texas Business and Commerce Code, or the federal antitrust laws, or (2) communicated directly or indirectly the contents of this Contract or any solicitation response upon which this Contract is based to any competitor or any other person engaged in the same line of business as .
2. If the Contract is for services, shall comply with Section 2155.4441 of the Texas Government Code, requiring the purchase of products and materials produced in the State of Texas in performing service contracts.
3. Under Section 231.006 of the Family Code, the vendor or applicant [] certifies that the individual or business entity named in this Contract, bid or application is not ineligible to receive the specified grant, loan, or payment and acknowledges that this Contract may be terminated and payment may be withheld if this certification is inaccurate.
4. A bid or an application for a contract, grant, or loan paid from state funds must include the name and social security number of the individual or sole proprietor and each partner, shareholder, or owner with an ownership interest of at least 25 percent of the business entity submitting the bid or application. certifies it has submitted this information to the GLO.
5. If the Contract is for the purchase or lease of computer equipment, as defined by Texas Health and Safety Code Section 361.952(2), certifies that it is in compliance with Subchapter Y, Chapter 361 of the Texas Health and Safety Code, related to the Computer Equipment Recycling Program and the Texas Commission on Environmental Quality rules in Title 30 Texas Administrative Code Chapter 328.
6. Pursuant to Section 2155.003 of the Texas Government Code, represents and warrants that it has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the Contract.
7. Payments due under the Contract shall be directly applied towards eliminating any debt or delinquency owes to the State of Texas including, but not limited to, delinquent taxes, delinquent student loan payments, and delinquent child support.
8. Upon request of the GLO, shall provide copies of its most recent business continuity and disaster recovery plans.
9. If the Contract is for consulting services governed by Texas Government Code Chapter 2254, Subchapter B, in accordance with Section 2254.033 of the Texas Government Code, relating to consulting services, certifies that it does not employ an individual who has been employed by The GLO or another agency at any time during the two years preceding the 's submission of its offer to provide consulting services to the GLO or, in the alternative, , in its offer to provide consulting services to the GLO, disclosed the following: (i) the nature of the previous employment with the GLO or other state agency; (ii) the date

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the employment was terminated; and (iii) the annual rate of compensation for the employment at the time of its termination.

10. If the Contract is not for architecture, engineering, or construction services, except as otherwise provided by statute, rule, or regulation, must use the dispute resolution process provided for in Chapter 2260 of the Texas Government Code to attempt to resolve any dispute arising under the Contract. NOTHING IN THIS SECTION SHALL BE CONSTRUED AS A WAIVER OF SOVEREIGN IMMUNITY BY THE GLO.
11. If the Contract is for architecture, engineering, or construction services, subject to Texas Government Code, Section 2260.002 and Texas Civil Practice and Remedies Code Chapter 114, and except as otherwise provided by statute, rule, or regulation, shall use the dispute resolution process provided for in Chapter 2260 of the Texas Government Code to attempt to resolve all disputes arising under this Contract. Except as otherwise provided by statute, rule, or regulation, in accordance with the Texas Civil Practice and Remedies Code, Section 114.005, claims encompassed by Texas Government Code, Section 2260.002(3) and Texas Civil Practice and Remedies Code Section 114.002 shall be governed by the dispute resolution process set forth below in subsections (a)-(d). NOTHING IN THIS SECTION SHALL BE CONSTRUED AS A WAIVER OF SOVEREIGN IMMUNITY BY THE GLO.
 - a. Notwithstanding Texas Government Code, Chapter 2260.002(3) and Chapter 114.012 and any other statute or applicable law, if the 's claim for breach of contract cannot be resolved by the parties in the ordinary course of business, may make a claim against the GLO for breach of contract and the GLO may assert a counterclaim against the as is contemplated by Texas Government Code, Chapter 2260, Subchapter B. In such event, must provide written notice to the GLO of a claim for breach of the Contract not later than the 180th day after the date of the event giving rise to the claim. The notice must state with particularity: (1) the nature of the alleged breach; (2) the amount the seeks as damages; and (3) the legal theory of recovery.
 - b. The chief administrative officer, or if designated in the Contract, another officer of the GLO, shall examine the claim and any counterclaim and negotiate with the in an effort to resolve them. The negotiation must begin no later than the 120th day after the date the claim is received, as is contemplated by Texas Government Code, Chapter 2260, Section 2260.052.
 - c. If the negotiation under paragraph (b) above results in the resolution of some disputed issues by agreement or in a settlement, the parties shall reduce the agreement or settlement to writing and each party shall sign the agreement or settlement. A partial settlement or resolution of a claim does not waive a party's rights under this Contract as to the parts of the claim that are not resolved.
 - d. If a claim is not entirely resolved under paragraph (b) above, on or before the 270th day after the date the claim is filed with the GLO, unless the parties agree in writing to an extension of time, the parties may agree to mediate a claim made under this dispute resolution procedure. This dispute resolution procedure is the 's sole and exclusive process for seeking a remedy for an alleged breach of contract by the GLO if the parties are unable to resolve their disputes as described in this section.
 - e. Nothing in the Contract shall be construed as a waiver of the state's or the GLO's sovereign immunity. This Contract shall not constitute or be construed as a waiver of any of the privileges, rights, defenses, remedies, or immunities available to the State of Texas. The failure to enforce, or any delay in the enforcement, of any privileges, rights, defenses, remedies, or immunities available

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to the State of Texas under this Contract or under applicable law shall not constitute a waiver of such privileges, rights, defenses, remedies or immunities or be considered as a basis for estoppel. The GLO does not waive any privileges, rights, defenses, or immunities available to it by entering into this Contract or by its conduct, or by the conduct of any representative of the GLO, prior to or subsequent to entering into this Contract.

- f. Except as otherwise provided by statute, rule, or regulation, compliance with the dispute resolution process provided for in Texas Government Code, Chapter 2260, subchapter B and incorporated by reference in subsection (a)-(d) above is a condition precedent to the: (1) filing suit pursuant to Chapter 114 of the Civil Practices and Remedies Code; or (2) initiating a contested case hearing pursuant to Subchapter C of Chapter 2260 of the Texas Government Code.
12. If Texas Government Code Chapter 2270 prohibiting state contracts with companies boycotting Israel applies to and this Contract, then verifies it does not boycott Israel and will not boycott Israel during the term of this Contract.
13. This Contract is contingent upon the continued availability of lawful appropriations by the Texas Legislature. understands that all obligations of the GLO under this Contract are subject to the availability of state funds. If such funds are not appropriated or become unavailable, the GLO may terminate the Contract. The Contract shall not be construed as creating a debt on behalf of the GLO in violation of Article III, Section 49a of the Texas Constitution.
14. certifies that it is not listed on the federal government's terrorism watch list as described in Executive Order 13224.
15. In accordance with Section 669.003 of the Texas Government Code, relating to contracting with the executive head of a state agency, certifies that it is not (1) the executive head of the GLO, (2) a person who at any time during the four years before the effective date of the Contract was the executive head of the GLO, or (3) a person who employs a current or former executive head of the GLO.
16. represents and warrants that all statements and information prepared and submitted in connection with this Contract are current, complete, true, and accurate. Submitting a false statement or making a material misrepresentation during the performance of this Contract is a material breach of contract and may void the Contract or be grounds for its termination.
17. Pursuant to Section 2155.004(a) of the Texas Government Code, certifies that neither nor any person or entity represented by has received compensation from the GLO to participate in the preparation of the specifications or solicitation on which this Contract is based. Under Section 2155.004(b) of the Texas Government Code, certifies that the individual or business entity named in this Contract is not ineligible to receive the specified contract and acknowledges that the Contract may be terminated, and payment withheld if this certification is inaccurate. This Section does not prohibit from providing free technical assistance.
18. represents and warrants that it is not engaged in business with Iran, Sudan, or a foreign terrorist organization, as prohibited by Section 2252.152 of the Texas Government Code.
19. If the Contract is for professional or consulting services governed by Texas Government Code Chapter 2254, represents and warrants that none of its employees including, but not limited to, those authorized

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- to provide services under the Contract, were former employees of the GLO during the twelve (12) month period immediately prior to the date of execution of the Contract.
20. The Contract shall be governed by and construed in accordance with the laws of the State of Texas, without regard to the conflicts of law provisions. The venue of any suit arising under the Contract is fixed in any court of competent jurisdiction of Travis County, Texas, unless the specific venue is otherwise identified in a statute which directly names or otherwise identifies its applicability to the GLO.
21. IF THE CONTRACT IS NOT FOR ARCHITECTURE OR ENGINEERING SERVICES GOVERNED BY TEXAS GOVERNMENT CODE CHAPTER 2254, , TO THE EXTENT ALLOWED BY LAW, SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS THE STATE OF TEXAS AND THE GLO, AND/OR THEIR OFFICERS, AGENTS, EMPLOYEES, REPRESENTATIVES, CONTRACTORS, ASSIGNEES, AND/OR DESIGNEES FROM ANY AND ALL LIABILITY, ACTIONS, CLAIMS, DEMANDS, OR SUITS, AND ALL RELATED COSTS, ATTORNEY FEES, AND EXPENSES ARISING OUT OF, OR RESULTING FROM ANY ACTS OR OMISSIONS OF OR ITS AGENTS, EMPLOYEES, SUBCONTRACTORS, ORDER FULFILLERS, OR SUPPLIERS OF SUBCONTRACTORS IN THE EXECUTION OR PERFORMANCE OF THE CONTRACT AND ANY PURCHASE ORDERS ISSUED UNDER THE CONTRACT. THE DEFENSE SHALL BE COORDINATED BY WITH THE OFFICE OF THE TEXAS ATTORNEY GENERAL WHEN TEXAS STATE AGENCIES ARE NAMED DEFENDANTS IN ANY LAWSUIT AND MAY NOT AGREE TO ANY SETTLEMENT WITHOUT FIRST OBTAINING THE CONCURRENCE FROM THE OFFICE OF THE TEXAS ATTORNEY GENERAL. AND THE GLO SHALL FURNISH TIMELY WRITTEN NOTICE TO EACH OTHER OF ANY SUCH CLAIM.
22. IF THE CONTRACT IS FOR ARCHITECTURE OR ENGINEERING SERVICES GOVERNED BY TEXAS GOVERNMENT CODE CHAPTER 2254, , TO THE EXTENT ALLOWED BY LAW, SHALL INDEMNIFY AND HOLD HARMLESS THE STATE OF TEXAS AND THE GLO, AND/OR THEIR OFFICERS, AGENTS, EMPLOYEES, REPRESENTATIVES, CONTRACTORS, ASSIGNEES, AND/OR DESIGNEES FROM ANY AND ALL LIABILITY, ACTIONS, CLAIMS, DEMANDS, OR SUITS, AND ALL RELATED DAMAGES, COSTS, ATTORNEY FEES, AND EXPENSES TO THE EXTENT CAUSED BY, ARISING OUT OF, OR RESULTING FROM ANY ACTS OF NEGLIGENCE, INTENTIONAL TORTS, WILLFUL MISCONDUCT, PERSONAL INJURY OR DAMAGE TO PROPERTY, AND/OR OTHERWISE RELATED TO 'S PERFORMANCE, AND/OR FAILURES TO PAY A SUBCONTRACTOR OR SUPPLIER BY THE OR ITS AGENTS, EMPLOYEES, SUBCONTRACTORS, ORDER FULFILLERS, CONSULTANTS UNDER CONTRACT TO , OR ANY OTHER ENTITY OVER WHICH THE CONTRACTOR EXERCISES CONTROL, OR SUPPLIERS OF SUBCONTRACTORS IN THE EXECUTION OR PERFORMANCE OF THE CONTRACT. THE DEFENSE SHALL BE COORDINATED BY WITH THE OFFICE OF THE TEXAS ATTORNEY GENERAL WHEN TEXAS STATE AGENCIES ARE NAMED DEFENDANTS IN ANY LAWSUIT AND MAY NOT AGREE TO ANY SETTLEMENT WITHOUT FIRST OBTAINING THE CONCURRENCE FROM THE OFFICE OF THE TEXAS ATTORNEY GENERAL. AND THE GLO SHALL FURNISH TIMELY WRITTEN NOTICE TO EACH OTHER OF ANY SUCH CLAIM.
23. TO THE EXTENT ALLOWED BY LAW, SHALL DEFEND, INDEMNIFY, AND HOLD HARMLESS THE GLO AND THE STATE OF TEXAS FROM AND AGAINST ANY AND ALL CLAIMS, VIOLATIONS, MISAPPROPRIATIONS OR INFRINGEMENT OF ANY PATENT, TRADEMARK, COPYRIGHT, TRADE SECRET OR OTHER INTELLECTUAL PROPERTY

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- RIGHTS AND/OR OTHER INTANGIBLE PROPERTY, PUBLICITY OR PRIVACY RIGHTS, AND/OR IN CONNECTION WITH OR ARISING FROM: (1) THE PERFORMANCE OR ACTIONS OF PURSUANT TO THIS CONTRACT; (2) ANY DELIVERABLE, WORK PRODUCT, CONFIGURED SERVICE OR OTHER SERVICE PROVIDED HEREUNDER; AND/OR (3) THE GLO'S AND/OR 'S USE OF OR ACQUISITION OF ANY REQUESTED SERVICES OR OTHER ITEMS PROVIDED TO THE GLO BY OR OTHERWISE TO WHICH THE GLO HAS ACCESS AS A RESULT OF 'S PERFORMANCE UNDER THE CONTRACT. AND THE GLO SHALL FURNISH TIMELY WRITTEN NOTICE TO EACH OTHER OF ANY SUCH CLAIM. SHALL BE LIABLE TO PAY ALL COSTS OF DEFENSE, INCLUDING ATTORNEYS' FEES. THE DEFENSE SHALL BE COORDINATED BY WITH THE OFFICE OF THE TEXAS ATTORNEY GENERAL (OAG) WHEN TEXAS STATE AGENCIES ARE NAMED DEFENDANTS IN ANY LAWSUIT AND MAY NOT AGREE TO ANY SETTLEMENT WITHOUT FIRST OBTAINING THE CONCURRENCE FROM OAG. IN ADDITION, WILL REIMBURSE THE GLO AND THE STATE OF TEXAS FOR ANY CLAIMS, DAMAGES, COSTS, EXPENSES OR OTHER AMOUNTS, INCLUDING, BUT NOT LIMITED TO, ATTORNEYS' FEES AND COURT COSTS, ARISING FROM ANY SUCH CLAIM. IF THE GLO DETERMINES THAT A CONFLICT EXISTS BETWEEN ITS INTERESTS AND THOSE OF OR IF THE GLO IS REQUIRED BY APPLICABLE LAW TO SELECT SEPARATE COUNSEL, THE GLO WILL BE PERMITTED TO SELECT SEPARATE COUNSEL AND WILL PAY ALL REASONABLE COSTS OF THE GLO'S COUNSEL.
24. has disclosed in writing to the GLO all existing or potential conflicts of interest relative to the performance of the Contract.
 25. Sections 2155.006 and 2261.053 of the Texas Government Code prohibit state agencies from accepting a solicitation response or awarding a contract that includes proposed financial participation by a person who, in the past five years, has been convicted of violating a federal law or assessed a penalty in connection with a contract involving relief for Hurricane Rita, Hurricane Katrina, or any other disaster, as defined by Section 418.004 of the Texas Government Code, occurring after September 24, 2005. Under Sections 2155.006 and 2261.053 of the Texas Government Code, certifies that the individual or business entity named in this Contract is not ineligible to receive the specified contract and acknowledges that this Contract may be terminated, and payment withheld if this certification is inaccurate.
 26. understands that the GLO will comply with the Texas Public Information Act (Chapter 552 of the Texas Government Code) as interpreted by judicial rulings and opinions of the Attorney General of the State of Texas. Information, documentation, and other material related to this Contract may be subject to public disclosure pursuant to the Texas Public Information Act. In accordance with Section 2252.907 of the Texas Government Code, shall make any information created or exchanged with the State/GLO pursuant to the Contract, and not otherwise excepted from disclosure under the Texas Public Information Act, available in a format that is accessible by the public at no additional charge to the State or the GLO.
 27. The person executing this Contract certifies that he/she is duly authorized to execute this Contract on his/her own behalf or on behalf of and legally empowered to contractually bind to the terms and conditions of the Contract and related documents.
 28. If the Contract is for architectural or engineering services, pursuant to Section 2254.0031 of the Texas Government Code, which incorporates by reference Section 271.904(d) of the Texas Local Government Code, shall perform services (1) with professional skill and care ordinarily provided by competent engineers or architects practicing under the same or similar circumstances and professional license, and

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- (2) as expeditiously as is prudent considering the ordinary professional skill and care of a competent engineer or architect.
29. The state auditor may conduct an audit or investigation of any entity receiving funds from the state directly under the Contract or indirectly through a subcontract under the Contract. The acceptance of funds directly under the Contract or indirectly through a subcontract under the Contract acts as acceptance of the authority of the state auditor, under the direction of the legislative audit committee, to conduct an audit or investigation in connection with those funds. Under the direction of the legislative audit committee, an entity that is the subject of an audit or investigation by the state auditor must provide the state auditor with access to any information the state auditor considers relevant to the investigation or audit. shall ensure that this paragraph concerning the authority to audit funds received indirectly by subcontractors through the Contract and the requirement to cooperate is included in any subcontract it awards. The GLO may unilaterally amend the Contract to comply with any rules and procedures of the state auditor in the implementation and enforcement of Section 2262.154 of the Texas Government Code.
30. certifies that neither it nor its principals are debarred, suspended, proposed for debarment, declared ineligible, or otherwise excluded from participation in the Contract by any state or federal agency.
31. expressly acknowledges that state funds may not be expended in connection with the purchase of an automated information system unless that system meets certain statutory requirements relating to accessibility by persons with visual impairments. Accordingly, represents and warrants to the GLO that any technology provided to the GLO for purchase pursuant to this Contract is capable, either by virtue of features included within the technology or because it is readily adaptable by use with other technology, of: providing equivalent access for effective use by both visual and non-visual means; presenting information, including prompts used for interactive communications, in formats intended for non-visual use; and being integrated into networks for obtaining, retrieving, and disseminating information used by individuals who are not blind or visually impaired. For purposes of this Section, the phrase “equivalent access” means a substantially similar ability to communicate with or make use of the technology, either directly by features incorporated within the technology or by other reasonable means such as assistive devices or services which would constitute reasonable accommodations under the Americans With Disabilities Act or similar state or federal laws. Examples of methods by which equivalent access may be provided include, but are not limited to, keyboard alternatives to mouse commands and other means of navigating graphical displays, and customizable display appearance.
32. If the Contract is for the purchase or lease of covered television equipment, as defined by Section 361.971(3) of the Texas Health and Safety Code, certifies its compliance with Subchapter Z, Chapter 361 of the Texas Health and Safety Code, related to the Television Equipment Recycling Program.
33. Pursuant to Section 572.069 of the Texas Government Code, certifies it has not employed and will not employ a former state officer or employee who participated in a procurement or contract negotiations for the GLO involving within two (2) years after the date that the contract is signed, or the procurement is terminated or withdrawn. This certification only applies to former state officers or employees whose state service or employment ceased on or after September 1, 2015.
34. The GLO does not tolerate any type of fraud. GLO policy promotes consistent, legal, and ethical organizational behavior by assigning responsibilities and providing guidelines to enforce controls. Any violations of law, agency policies, or standards of ethical conduct will be investigated, and appropriate

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- actions will be taken. shall report any possible fraud, waste, or abuse that occurs in connection with the Contract to the GLO's Fraud Reporting hotline at (877) 888-0002.
35. The requirements of Subchapter J, Chapter 552, Government Code, may apply to this contract and agrees that the Contract can be terminated if knowingly or intentionally fails to comply with a requirement of that subchapter.
36. If, in its performance of the Contract, has access to a state computer system or database, must complete a cybersecurity training program certified under Texas Government Code Section 2054.519, as selected by the GLO. must complete the cybersecurity training program during the initial term of the Contract and during any renewal period. must verify in writing to the GLO its completion of the cybersecurity training program.
37. Under Section 2155.0061, Texas Government Code, certifies that the entity named in this contract is not ineligible to receive the specified contract and acknowledges that this contract may be terminated and payment withheld if this certification is inaccurate.

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65. SECTION 231.006, FAMILY CODE/DELINQUENT CHILD SUPPORT

Pursuant to Title 5, Section 231.006 of the Texas Family Code, as applicable, Proposer certifies that it, including all of its principals, is/are current in child support payments and that it is eligible to receive payments from State funds under a contract for property, materials, or services. Proposer acknowledges and agrees that if it is awarded this contract, then the ensuing agreement may be terminated, and payment withheld if this certification is inaccurate. Finally, by the submission of its Proposal, the Proposer certifies that it has included the names and social security numbers of each person with at least 25% ownership interest in Proposer within its response to the request for Proposal and that all such persons are current in child support payments.

66. ANTITRUST

Pursuant to 15 U.S.C. § 1, et seq., and Texas Business and Commerce Code, Chapter 15, Contractor, by the submission of its Proposal, certifies that neither Contractor nor any natural person, proprietorship, firm, corporation, partnership, association, or institution represented by Contractor or anyone acting for such natural person, proprietorship, firm, corporation, partnership, association, or institution has violated any Federal or State antitrust laws or communicated the nature of the offer, directly or indirectly, to any competitor or other person engaged in a similar line of business.

67. LABOR STANDARDS

On contracts funded under a federal grant: Proposer acknowledges that the contract to be awarded pursuant to this solicitation is on a grant program funded with Federal funds. Proposer shall comply with the requirements of 29 CFR Part 5 and Part 30 and shall be in conformity with Executive Order 11246, entitled "Equal Employment Opportunity", Copeland, "Anti-Kickback" Act (40 U.S.C. 3145, 29 C.F.R. Part 3), the Davis-Bacon and Related Acts (40 U.S.C. 3141-3148, 29 C.F.R. Parts 1,3, and 5), the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.), and all other applicable Federal, State, and local laws and regulations pertaining to labor standards, insofar as those acts apply to the performance of this Agreement. Proposer is also responsible for ensuring that all subcontractors comply with the requirements of 29 CFR Part 5 and Part 30 and shall be in conformity with Executive Order 11246, entitled "Equal Employment Opportunity", Copeland "Anti-Kickback" Act, the Davis-Bacon and Related Acts (29 CFR Parts 1, 3 and 5), the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.), and all other applicable Federal, State, and local laws and regulations pertaining to labor standards, insofar as those acts apply to the performance of this Agreement.

Contractor is encouraged to use local labor, but not at the expense of poor workmanship and higher cost. Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. Contractor agrees to post in a conspicuous place a notice setting forth provisions of this non-discrimination clause.

68. PROCUREMENT STANDARDS - 2 C.F.R. §§ 200.317 – 200.326 & 2 C.F.R. PART 200, APPENDIX II

The Office of Management and Budget (OMB) revised the Uniform Guidance for grants (2 C.F.R. part 200) on August 13, 2020. This was the first major updating of the Uniform Guidance since 2014.

Effective Date:

- The full suite of changes became effective November 12, 2020. They will apply to all new Grants to States awards issued after that date, including the FY2021 awards.

Procurement:

New provisions for procurements by States (2 C.F.R. § 200.317):

When procuring property and services under an award, a State will continue to follow the same policies and procedures it uses for procurement from its non-Federal funds. A State must now also comply with §§ 200.321

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(contracting with small and minority businesses, women's business enterprises, and labor surplus area firms) and 200.322 (domestic preferences for procurements); and continue to comply with § 200.323 (procurement of recovered materials).

New provisions for all other non-Federal entities, including subrecipients of a State:

The OMB explains in the Aug. 13, 2020, Federal Register notice for the Uniform Guidance revisions, the following changes were made to 2 C.F.R § 200.320 (methods of procurement):

- The procurement types are now grouped into three categories:
 - (1) Informal (micro-purchase, small purchase);
 - (2) Formal (sealed Proposals, proposals); and
 - (3) Non-Competitive (sole source).

The micro-purchase threshold is raised from \$3,500 to \$10,000. Micro-purchase thresholds higher than \$10,000 are based on certain conditions that include a requirement to maintain records for threshold up to \$50,000 and a formal approval process by the Fed. Govt. for threshold above \$50,000.

More specifically, for Grants to States:

- (1) the subrecipient may self-certify an increase of the micro-purchase threshold up to \$50,000 (based on certain requirements).
- (2) micro-purchase thresholds higher than \$50,000 must be approved by the cognizant agency for indirect costs. (for details, see 2 C.F.R § 200.320 (a) (1) (iii) and (iv)).

The simplified acquisition threshold is raised from \$150,000 to \$250,000.

Two contract clauses were added to Appendix II of 2 C.F.R. Part 200. In addition to the previous contract clauses contained in the 2014 version of Appendix II of 2 C.F.R. Part 200, FEMA award recipient and subrecipient contracts and purchase orders must now include contract provisions for *Domestic Preferences for Procurements* (2 C.F.R. 200.322) and the *Prohibition on Contracting for Covered Telecommunications or Services* (2 C.F.R. 200.316)

2 C.F.R. § 200.317. Procurements by states.

When procuring property and services under a Federal award, a state must follow the same policies and procedures it uses for procurements from its non-Federal funds. The state will comply with §200.322 Procurement of recovered materials and ensure that every purchase order or other contract includes any clauses required by section §200.326 Contract provisions. All other non-Federal entities, including subrecipients of a state, will follow §§ 200.318 General procurement standards through 200.326 Contract provisions.

69 FR 26280, May 11, 2004; 78 FR 78608, Dec. 26, 2013

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2 C.F.R. § 200.318. General procurement standards.

- (a) The non-Federal entity must use its own documented procurement procedures which reflect applicable State, local and tribal laws and regulations, provided that the procurements conform to applicable Federal law and the standards identified in this part.
- (b) Non-Federal entities must maintain oversight to ensure that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders.
- (c)
- (1) The non-Federal entity must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest. Such a conflict of interest would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract. The officers, employees, and agents of the non-Federal entity may neither solicit nor accept gratuities, favors, or anything of monetary value from contractors or parties to subcontracts. However, non-Federal entities may set standards for situations in which the financial interest is not substantial or the gift is an unsolicited item of nominal value. The standards of conduct must provide for disciplinary actions to be applied for violations of such standards by officers, employees, or agents of the non-Federal entity.
- (2) If the non-Federal entity has a parent, affiliate, or subsidiary organization that is not a state, local government, or Indian tribe, the non-Federal entity must also maintain written standards of conduct covering organizational conflicts of interest. Organizational conflicts of interest means that because of relationships with a parent company, affiliate, or subsidiary organization, the non-Federal entity is unable or appears to be unable to be impartial in conducting a procurement action involving a related organization.
- (d) The non-Federal entity's procedures must avoid acquisition of unnecessary or duplicative items. Consideration should be given to consolidating or breaking out procurements to obtain a more economical purchase. Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach.
- (e) To foster greater economy and efficiency, and in accordance with efforts to promote cost-effective use of shared services across the Federal Government, the non-Federal entity is encouraged to enter into state and local intergovernmental agreements or inter-entity agreements where appropriate for procurement or use of common or shared goods and services.
- (f) The non-Federal entity is encouraged to use Federal excess and surplus property in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs.
- (g) The non-Federal entity is encouraged to use value engineering clauses in contracts for construction projects of sufficient size to offer reasonable opportunities for cost reductions. Value engineering is a systematic and creative analysis of each contract item or task to ensure that its essential function is provided at the overall lower cost.
- (h) The non-Federal entity must award contracts only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement. Consideration will be given

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to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources. See also § 200.213 Suspension and debarment.

(i) The non-Federal entity must maintain records sufficient to detail the history of procurement. These records will include, but are not necessarily limited to the following: rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price.

(j)

(1) The non-Federal entity may use a time and materials type contract only after a determination that no other contract is suitable and if the contract includes a ceiling price that the contractor exceeds at its own risk. Time and materials type contract means a contract whose cost to a non-Federal entity is the sum of:

(i) The actual cost of materials; and

(ii) Direct labor hours charged at fixed hourly rates that reflect wages, general and administrative expenses, and profit.

(2) Since this formula generates an open-ended contract price, a time-and-materials contract provides no positive profit incentive to the contractor for cost control or labor efficiency. Therefore, each contract must set a ceiling price that the contractor exceeds at its own risk. Further, the non-Federal entity awarding such a contract must assert a high degree of oversight in order to obtain reasonable assurance that the contractor is using efficient methods and effective cost controls.

(k) The non-Federal entity alone must be responsible, in accordance with good administrative practice and sound business judgment, for the settlement of all contractual and administrative issues arising out of procurements. These issues include, but are not limited to, source evaluation, protests, disputes, and claims. These standards do not relieve the non-Federal entity of any contractual responsibilities under its contracts. The Federal awarding agency will not substitute its judgment for that of the non-Federal entity unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having proper jurisdiction.

78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75885, Dec. 19, 2014; 80 FR 43309, July 22, 2015; 80 FR 45395, July 30, 2015

2 C.F.R. § 200.319. Competition.

(a) All procurement transactions must be conducted in a manner providing full and open competition consistent with the standards of this section. In order to ensure objective contractor performance and eliminate unfair competitive advantage, contractors that develop or draft specifications, requirements, statements of work, or invitations for Proposals or requests for proposals must be excluded from competing for such procurements. Some of the situations considered to be restrictive of competition include but are not limited to:

(1) Placing unreasonable requirements on firms in order for them to qualify to do business;

(2) Requiring unnecessary experience and excessive bonding;

(3) Noncompetitive pricing practices between firms or between affiliated companies;

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- (4) Noncompetitive contracts to consultants that are on retainer contracts;
- (5) Organizational conflicts of interest;
- (6) Specifying only a “brand name” product instead of allowing “an equal” product to be offered and describing the performance or other relevant requirements of the procurement; and
- (7) Any arbitrary action in the procurement process.

(b) The non-Federal entity must conduct procurements in a manner that prohibits the use of statutorily or administratively imposed state, local, or tribal geographical preferences in the evaluation of Proposals or proposals, except in those cases where applicable Federal statutes expressly mandate or encourage geographic preference. Nothing in this section preempts state licensing laws. When contracting for architectural and engineering (A/E) services, geographic location may be a selection criterion provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.

(c) The non-Federal entity must have written procedures for procurement transactions. These procedures must ensure that all solicitations:

(1) Incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description must not, in competitive procurements, contain features which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured and, when necessary, must set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible. When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a “brand name or equivalent” description may be used as a means to define the performance or other salient requirements of procurement. The specific features of the named brand which must be met by offers must be clearly stated; and

(2) Identify all requirements which the offerors must fulfill and all other factors to be used in evaluating Proposals or proposals.

(d) The non-Federal entity must ensure that all prequalified lists of persons, firms, or products which are used in acquiring goods and services are current and include enough qualified sources to ensure maximum open and free competition. Also, the non-Federal entity must not preclude potential Proposers from qualifying during the solicitation period.

78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75885, Dec. 19, 2014

2 C.F.R. § 200.320. Methods of procurement to be followed.

The non-Federal entity must use one of the following methods of procurement.

(a) Procurement by micro-purchases. Procurement by micro-purchase is the acquisition of supplies or services, the aggregate dollar amount of which does not exceed the micro-purchase threshold (§200.67 Micro-purchase). To the extent practicable, the non-Federal entity must distribute micro-purchases equitably among qualified suppliers. Micro-purchases may be awarded without soliciting competitive quotations if the non-Federal entity considers the price to be reasonable.

(b) Procurement by small purchase procedures. Small purchase procedures are those relatively simple and informal procurement methods for securing services, supplies, or other property that do not cost more than the Simplified

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Acquisition Threshold. If small purchase procedures are used, price or rate quotations must be obtained from an adequate number of qualified sources.

(c) Procurement by sealed Proposals (formal advertising). Proposals are publicly solicited and a firm fixed price contract (lump sum or unit price) is awarded to the responsible Proposer whose bid, conforming with all the material terms and conditions of the Request for Proposals, is the lowest in price. The sealed bid method is the preferred method for procuring construction if the conditions in paragraph (c)(1) of this section apply.

(1) In order for sealed bidding to be feasible, the following conditions should be present:

- (i) A complete, adequate, and realistic specification or purchase description is available;
- (ii) Two or more responsible Proposers are willing and able to compete effectively for the business;
and
- (iii) The procurement lends itself to a firm fixed price contract and the selection of the successful Proposer can be made principally on the basis of price.

(2) If sealed bids are used, the following requirements apply:

(i) Bids must be solicited from an adequate number of known suppliers, providing them sufficient response time prior to the date set for opening the bids, for local, and tribal governments, the invitation for bids must be publicly advertised;

(ii) The invitation for bids, which will include any specifications and pertinent attachments, must define the items or services in order for the Proposer to properly respond;

(iii) All bids will be opened at the time and place prescribed in the invitation for bids, and for local and tribal governments, the bids must be opened publicly;

(iv) A firm fixed price contract award will be made in writing to the lowest responsive and responsible Proposer. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs must be considered in determining which bid is lowest. Payment discounts will only be used to determine the low bid when prior experience indicates that such discounts are usually taken advantage of; and

(v) Any or all bids may be rejected if there is a sound documented reason.

(d) Procurement by competitive proposals. The technique of competitive proposals is normally conducted with more than one source submitting an offer, and either a fixed price or cost-reimbursement type contract is awarded. It is generally used when conditions are not appropriate for the use of sealed bids. If this method is used, the following requirements apply:

(1) Requests for proposals must be publicized and identify all evaluation factors and their relative importance. Any response to publicized requests for proposals must be considered to the maximum extent practical;

(2) Proposals must be solicited from an adequate number of qualified sources;

(3) The non-Federal entity must have a written method for conducting technical evaluations of the proposals received and for selecting recipients;

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(4) Contracts must be awarded to the responsible firm whose proposal is most advantageous to the program, with price and other factors considered; and

(5) The non-Federal entity may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby competitors' qualifications are evaluated and the most qualified competitor is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E firms are a potential source to perform the proposed effort.

(e) [Reserved]

(f) Procurement by noncompetitive proposals. Procurement by noncompetitive proposals is procurement through solicitation of a proposal from only one source and may be used only when one or more of the following circumstances apply:

(1) The item is available only from a single source;

(2) The public exigency or emergency for the requirement will not permit a delay resulting from competitive solicitation;

(3) The Federal awarding agency or pass-through entity expressly authorizes noncompetitive proposals in response to a written request from the non-Federal entity; or

(4) After solicitation of a number of sources, competition is determined inadequate.

78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75885, Dec. 19, 2014; 80 FR 54409, Sept. 10, 2015

2 C.F.R. § 200.321. Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms.

(a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.

(b) Affirmative steps must include:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;

(4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

(5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and

(6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (1) through (5) of this section.

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69 FR 26280, May 11, 2004; 78 FR 78608, Dec. 26, 2013, unless otherwise noted

2 C.F.R. § 200.322. Procurement of recovered materials.

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75885, Dec. 19, 2014

2 C.F.R. § 200.323. Contract cost and price.

(a) The non-Federal entity must perform a cost or price analysis in connection with every procurement action in excess of the Simplified Acquisition Threshold including contract modifications. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, the non-Federal entity must make independent estimates before receiving bids or proposals.

(b) The non-Federal entity must negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is performed. To establish a fair and reasonable profit, consideration must be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.

(c) Costs or prices based on estimated costs for contracts under the Federal award are allowable only to the extent that costs incurred or cost estimates included in negotiated prices would be allowable for the non-Federal entity under Subpart E—Cost Principles of this part. The non-Federal entity may reference its own cost principles that comply with the Federal cost principles.

(d) The cost plus a percentage of cost and percentage of construction cost methods of contracting must not be used.

69 FR 26280, May 11, 2004; 78 FR 78608, Dec. 26, 2013, unless otherwise noted

2 C.F.R. § 200.324. Federal awarding agency or pass-through entity review.

(a) The non-Federal entity must make available, upon request of the Federal awarding agency or pass-through entity, technical specifications on proposed procurements where the Federal awarding agency or pass-through entity believes such review is needed to ensure that the item or service specified is the one being proposed for acquisition. This review generally will take place prior to the time the specification is incorporated into a solicitation document. However, if the non-Federal entity desires to have the review accomplished after a solicitation has been developed, the Federal awarding agency or pass-through entity may still review the specifications, with such review usually limited to the technical aspects of the proposed purchase.

(b) The non-Federal entity must make available upon request, for the Federal awarding agency or pass-through entity pre-procurement review, procurement documents, such as requests for proposals or invitations for bids, or independent cost estimates, when:

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- (1) The non-Federal entity's procurement procedures or operation fails to comply with the procurement standards in this part;
- (2) The procurement is expected to exceed the Simplified Acquisition Threshold and is to be awarded without competition or only one bid or offer is received in response to a solicitation;
- (3) The procurement, which is expected to exceed the Simplified Acquisition Threshold, specifies a “brand name” product;
- (4) The proposed contract is more than the Simplified Acquisition Threshold and is to be awarded to other than the apparent low Proposer under a sealed bid procurement; or
- (5) A proposed contract modification changes the scope of a contract or increases the contract amount by more than the Simplified Acquisition Threshold.

(c) The non-Federal entity is exempt from the pre-procurement review in paragraph (b) of this section if the Federal awarding agency or pass-through entity determines that its procurement systems comply with the standards of this part.

(1) The non-Federal entity may request that its procurement system be reviewed by the Federal awarding agency or pass-through entity to determine whether its system meets these standards in order for its system to be certified. Generally, these reviews must occur where there is continuous high-dollar funding, and third party contracts are awarded on a regular basis;

(2) The non-Federal entity may self-certify its procurement system. Such self-certification must not limit the Federal awarding agency's right to survey the system. Under a self-certification procedure, the Federal awarding agency may rely on written assurances from the non-Federal entity that it is complying with these standards. The non-Federal entity must cite specific policies, procedures, regulations, or standards as being in compliance with these requirements and have its system available for review.

69 FR 26280, May 11, 2004; 78 FR 78608, Dec. 26, 2013, unless otherwise noted

2 C.F.R. § 200.325. Bonding requirements.

For construction or facility improvement contracts or subcontracts exceeding the Simplified Acquisition Threshold, the Federal awarding agency or pass-through entity may accept the bonding policy and requirements of the non-Federal entity provided that the Federal awarding agency or pass-through entity has made a determination that the Federal interest is adequately protected. If such a determination has not been made, the minimum requirements must be as follows:

- (a) A bid guarantee from each Proposer equivalent to five percent of the bid price. The “bid guarantee” must consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the Proposer will, upon acceptance of the bid, execute such contractual documents as may be required within the time specified.
- (b) A performance bond on the part of the contractor for 100 percent of the contract price. A “performance bond” is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
- (c) A payment bond on the part of the contractor for 100 percent of the contract price. A “payment bond” is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

69 FR 26280, May 11, 2004; 78FR 78608, Dec. 26, 2013, unless otherwise noted

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2 C.F.R. § 200.326. Contract provisions.

The non-Federal entity's contracts must contain the applicable provisions described in Appendix II to Part 200—Contract Provisions for non-Federal Entity Contracts Under Federal Awards.

69 FR 26280, May 11, 2004; 78 FR 78608, Dec. 26, 2013, unless otherwise note

2 C.F.R. Part, 200, Appendix II

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

(A) Contracts for more than the simplified acquisition threshold currently set at \$150,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

(B) All contracts in excess of \$10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement.

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

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

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

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unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

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

(G) Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of \$150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

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

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

(J) See §200.322 Procurement of recovered materials.

78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75888, Dec. 19, 2014

DOMESTIC PREFERENCES FOR PROCUREMENTS *(All State and non-State entity purchase orders must adhere to the following)*

§ 200.322 Domestic preferences for procurements.

(a) As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

(b) For purposes of this section:

(1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

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(2) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

PROHIBITION ON CONTRACTING FOR COVERED TELECOMMUNICATIONS OR SERVICES
(Effective August 13, 2020 for new, extended, or renewed procurements under all open FEMA awards)

§ 200.216 Prohibition on certain telecommunications and video surveillance services or equipment.

(a) Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to:

(1) Procure or obtain;

(2) Extend or renew a contract to procure or obtain; or

(3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

(i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

(iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

(b) In implementing the prohibition under Public Law 115-232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

(c) See Public Law 115-232, section 889 for additional information.

(c) See also § 200.471.

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69. PROCUREMENT LAWS

- a. Proposer shall comply with all applicable local, State, and Federal laws, rules, and regulations.
- b. If this contract is made pursuant to a federal award, then Contractor acknowledges that the contract is subject, without limitation, to applicable provisions within 2 C.F.R. Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards. Contractor shall comply with applicable provisions within 2 C.F.R., Sections 200.319 through 200.326, including but not limited to the following:
 - 1.) **Equal Employment Opportunity**, 41 C.F.R. Part 60-1.4(b) (applicable to federally assisted construction contracts).
 - (a) During the performance of this contract, the contractor agrees as follows:
 - (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national original, disability, or veteran status. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, national original, disability or veteran status. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
 - (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national original, disability, or veteran status.
 - (3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - (4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and by rules, regulations, and relevant orders of the Secretary of Labor.
 - (5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to contractor's books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
 - (6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
 - (7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering

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agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

- 2.) **Small and minority business, women’s business enterprises, and labor surplus area firms (2 C.F.R. § 200.321).** The County is required to take affirmative steps to assure that minority businesses, women’s business enterprises, and labor surplus area firms are used when possible. This includes requiring the prime contractor, if subcontracts are to be let in the performance of this contract, to itself take affirmative steps in letting the subcontract. Accordingly, if subcontracts are to be let in the performance of this contract, the contractor must take affirmative steps in the letting of the subcontract(s), which must include:
- (a) placing qualified small and minority businesses and women’s business enterprises on solicitation lists;
 - (b) assuring that small and minority businesses, and women’s business enterprises are solicited whenever they are potential sources;
 - (c) dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women’s business enterprises; and
 - (d) using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

In accordance with FEMA procurement guidance:

A small business is a business that is independently owned and operated, not dominant in the field of operation in which it is bidding on Galveston County contracts and qualified as a small business under the Small Business Administration criteria and size standards at 13 C.F.R. Part 121.

A women’s business enterprise is a business enterprise that is: (a) at least 51 percent owned by one or more women or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women; and (b) whose management and daily operations are controlled by one or more women.

A minority business is a business that is (a) at least 51 percent owned by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority group members; and (b) whose management and daily operations are controlled by one or more minority group members.

- 3.) **Davis-Bacon Act as amended (40 U.S.C. 3141-3148).** When required by Federal program legislation, all prime construction contracts in excess of \$2,000 must include a provision for compliance with the Davis-Bacon Act as supplemented by the Department of Labor regulations (29 C.F.R. Part 5, “Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction”). In accordance with the statute, contractor must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity (the County) must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be condition upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contract must also include a provision for compliance with the Copeland Anti-Kickback Act (40 U.S.C. § 3145) as supplemented by the Department of Labor regulations (29 C.F.R. Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”).
- 4.) **Compliance with the Copeland “Anti-Kickback” Act.** Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which the person is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. “Whoever, by force, intimidation, or threat of procuring dismissal from employment, or by any other manner whatsoever induces any person employed in the construction, prosecution, completion or repair of

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any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, to give up any part of the compensation to which he is entitled under his contract of employment, shall be fined under this title [Title 18, U.S.C.] or imprisoned not more than five years, or both.” 18 U.S.C. § 874.

- (a) Contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. Part 3 as may be applicable, which are incorporated by reference into this contract.
- (b) The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as the Federal awarding agency may be appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
- (c) Breach. A breach of the contract clause above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

5.) Contract Work Hours and Safety Standards Act.

- (a) Where applicable, all contracts awarded by the County in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704, as supplemented by the Department of Labor regulations at 29 C.F.R. Part 5. Under 40 U.S.C. § 3702 of the Contract Work Hours and Safety Standards Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.S. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchase of supplies or material or articles ordinarily available on the open market, or contractors for transportation or transmission of intelligence.
- (b) Compliance with the Contract Work Hours and Safety Standards Act.
 - (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
 - (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this subsection the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this subsection, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard work week of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this subsection.
 - (3) Withholding for unpaid wages and liquidated damages. The awarding Federal agency, State agency, or the County shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy

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any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this subsection.

- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this subsection and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this subsection.

6.) Rights to Inventions Made Under a Contractor Agreement.

- (a) If the Federal award meets the definition of “funding agreement” under 37 C.F.R. § 401.2(a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under the “funding agreement,” the recipient or subrecipient must comply with the requirements of 37 C.F.R. Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.
- (b) Stafford Act Disaster Grants. This requirement does not apply to Public Assistance, Hazard Mitigation Grant Program, Crisis Counseling Assistance and Training Grant program, Disaster Case Management Grant Program, and Federal Assistance to Individuals and Households – Other Needs Assistance Grant Program, as FEMA awards under these programs do not meet the definition of “funding agreement.”
- (c) The regulations and 37 C.F.R. § 401.2(a) currently defines “funding agreement” as any contract, grant, or cooperative agreement entered into between any Federal agency, other than the Tennessee Valley Authority, and any contractor for the performance of experimental, developmental, or research work funded in whole or in part by the Federal government. This term also includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under a funding agreement as defined in the first sentence of this paragraph.

7.) Clean Air Act (42 U.S.C. §§ 7401 – 7671q) and the Federal Water Pollution Control Act 933 U.S.C. §§ 1251-1387), as amended.

- (a) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401, et seq., and agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S. C. § 1251, et seq.
- (b) The contractor agrees to report each violation of the Clean Air Act and/or the Federal Water Pollution Control Act to the Federal awarding agency, the State agency administering the grant, and the Regional Office of the Environmental Protection Agency (EPA) and understands and agrees that the Federal awarding agency, the State agency, and the EPA will, in turn, report each violation as required to assure notification to Galveston County, the Federal Emergency Management Agency, and the appropriate EPA Regional Office.

- 8.) Debarment and Suspension (Executive Orders 12549 and 12689).** A contract award must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. Part 180 that implement Executive Orders 12549 and 12689. The Contractor is required to verify that none of the contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

Contractor must comply with 2 C.F.R. Part 180, Subpart C and 2 C.F.R. Part 3000, Subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. Proposer agrees to comply with the requirements of 2 C.F.R. Part 180, Subpart C, and 2 C.F.R. Part 3000, Subpart C, while this offer is

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valid and through the period of any contract that may arise from this offer. The Proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

9.) Domestic Preferences for Procurements (2 C.F.R. § 200.323)

(a) As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

(c) For purposes of this section:

(1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

(2) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

**10.) Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.
(2 C.F.R. § 200.216)**

(a) Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to:

(1) Procure or obtain;

(2) Extend or renew a contract to procure or obtain; or

(2) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

(i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

(iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

(b) In implementing the prohibition under Public Law 115-232, section 889 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY 2019 NDAA), Pub. L. No. 115-232 (2018) and 2 C.F.R.

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200.216, 200.327, 200.471, and Appendix II to C.F.R. Part 200, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

(c) See Public Law 115-232, section 889 for additional information.

(d) See also § 200.471.

11.) Procurement of Recovered Materials (2 C.F.R. § 200.323)

(a.) A non-Federal entity that is a State agency or agency of a political subdivision of the State and its contractors must comply with Section 6002 of the Solid Waste Disposal Act, Public Law No. 89-272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962).

The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

(b.) In the performance of this contract, the contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:

- (1) Competitively within a timeframe providing for compliance with the contract performance schedule;
- (2) Meeting contract performance requirements; or
- (3) At a reasonable price.

(e) Information about this requirement is available at EPA's Comprehensive Procurement Guidelines website, <http://www.epa.gov/cpg/>. The list of EPA-designated items is available at <https://www.epa.gov/cpg/products.htm>.

In the event of any discrepancy between the provisions in this Section 63 of General Provisions and provisions on the same subject elsewhere within this procurement, the most stringent shall control.

70. SECTION 3 CLAUSE (§ 135.38) – HOUSING AND URBAN DEVELOPMENT (HUD)

SECTION 3 ACT OF 1968 (12 U.S.C. 1701u and 24 CFR Part 135)

DISCLAIMER: THIS CONTRACT [IS NOT] HUD-FUNDED AND THEREFORE SECTION 3 [DOES NOT] APPLY TO THIS CONTRACT.

For any HUD-funded contract with a value in excess of \$100,000, Contractor and subcontractors must comply with the Section 3 Act of 1968. The purpose of Section 3 is to ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, be directed to low- and very low-income persons, particularly those who

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are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

Section 3 is triggered when the normal completion of construction and rehabilitation projects creates the need for new employment, contracting, or training opportunities.

For any Section 3 Covered Contracts, Contractor and subcontractors must comply with all provisions of the Section 3 Act of 1968, contained under 24 CFR 135. Contractor and subcontractors must include the Section 3 Clause in its entirety, in every subcontract subject to compliance with regulations in 24 CFR 135.

Contractor and subcontractors must assure that to the greatest extent feasible, contracts for work to be performed in connection with the project are awarded to Section 3 Business Concerns. Contractor and subcontractors must post all new hire opportunities with the local Workforce Solutions Center and/or Work-in-Texas, in accordance with 24 CFR 135. The minimum numeric goals for Section 3 utilization are:

- 30 percent of total number of new hires are Section 3 Residents (i.e. 1 out of 3 new hires); 10 percent of all awarded construction contracts are awarded to Section 3 Business Concerns;
- 3 percent of all awarded non-construction contracts are awarded to Section 3 Business Concerns.

A. The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

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F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and sub contracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section

71. REQUIRED CONTRACT PROVISIONS

The Part 200 Uniform Requirements require that non-Federal entities' contracts contain the applicable provisions described in Appendix II to Part 200 — "Contract Provisions for Non-Federal Entity Contracts Under Federal Awards." Violations of law will be referred to the proper authority in the applicable jurisdiction. All Prime Contractors awarded contracts by Galveston County which are federally funded, in whole or in part, are required to comply with the provisions below. Additionally, Prime Contractors with Galveston County are required to include the provisions below in any contracts executed with subcontractors performing the scope of work and shall pass these requirements on to its subcontractors and third-party contractors, as applicable. In addition to other provisions required by the relevant Federal agency, State of Texas, or Galveston County, all contracts made by Galveston County under the Federal award shall contain provisions covering the following, as applicable.

ACCESS TO RECORDS & RECORD RETENTION (2 CFR 200.336)

Contractor must provide Galveston County, the State of Texas, the Texas General Land Office (GLO), the U.S. Department of Housing and Urban Development (HUD), the FEMA Administrator, the Inspectors General, the Comptroller General of the United States, or any of their pass-through entities or authorized representatives access to any books, documents, papers, and records of the Contractor and its subcontractors which are directly pertinent to this contract/project for the purposes of making/responding to audits, examinations, excerpts, and transcriptions. The right also includes timely and reasonable access to the Contractor's personnel for the purpose of interview and discussion related to such documents. Contractor must keep records within Galveston County or note in bid that records will be available within the boundaries of Galveston County to those representatives within twenty-four (24) hours of request by the County. Contractor must maintain all records pertaining to the project for seven (7) years after receiving final payment and after all other pending matters have been closed.

ACCESSIBILITY (24 CFR 570.614) & SECTION 504 (29 U.S.C. Section 794 and 24 CFR Parts 8-9)

Contractor shall comply with all federal, state and local laws and regulations which prohibit recipients of federal funding from discriminating against individuals with disabilities. Applicable laws and regulations with which Contractor shall comply shall include, but are not limited to, the following: Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. Section 794) (24 CFR Parts 8-9); Title II of the Americans with Disabilities Act of 1990; the Architectural Barriers Act of 1968 (42 U.S.C. 4151-4157); the Uniform Federal Accessibility Standards (Appendix A to 24 CFR Part 40 and Appendix A to 41 CFR Part 101-19, subpart 101-19.6); the Americans with Disabilities Act (42 U.S.C. 12131; 47 U.S.C. 155, 201, 218, and 225); Texas Administrative Code, Title 10, Chapter 60, Subchapter (B) the Texas Architectural Barriers Act (TABAA); the Architectural Barriers (AB) Rules; and the Texas Accessibility Standards (TAS).

BYRD ANTI-LOBBYING AGREEMENT (2 CFR 200 APPENDIX II (J) AND 24 CFR 570.303)

Pursuant to 31 U.S.C.A. § 1352 (2003), if at any time during the contract term funding to contract exceeds \$100,000.00, the Contractor shall file with the County the Federal Standard Form LLL titled "Disclosure Form to Report Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a

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member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-federal award.

CIVIL RIGHTS ACT OF 1964 (Title VI 42 U.S.C. § 2000d)

Title VI of the Civil Rights Act of 1964, Section 109 of the Community Development Act of 1974, Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. Section 794) (24 CFR Parts 8-9), and the Americans with Disabilities Act of 1990 (42 U.S.C. 12131; 47 U.S.C. 155, 201, 218, and 225), prohibits Contractors from excluding or denying individuals benefits or participation in this project on the basis of race, color, religion, national origin, sex, or disability. The provisions require that no person in the United States shall on the ground of race, color, religion, national origin, sex, or disability be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with community development funds made available pursuant to these Acts.

For purposes of this Part “program or activity” is defined as any function conducted by an identifiable administrative unit of the recipient, or private Contractor receiving community development funds or loans from the recipient. “Funded in whole or in part with community development funds” means that community development funds in any amount in the form of grants or proceeds from HUD guaranteed loans have been transferred by the recipient or a subrecipient to an identifiable administrative unit and disbursed in a program or activity. A Contractor may not, under any program or activity to which the regulations of this Part may apply directly or through contractual or other arrangements, on the grounds of race, color, national origin, or sex:

- a. Deny any facilities, services, financial aid or other benefits provided under the program or activity;
- b. Provide any facilities, services, financial aid or other benefits, which are different, or are provided in a different form from that provided to others under the program or activity;
- c. Subject to segregated or separate treatment in any facility in, or in any matter of process related to receipt of any service or benefit under the program or activity;
- d. Restrict in any way access to, or in the enjoyment of any advantage or privilege enjoyed by others in connection with facilities, services, financial aid or other benefits under the program or activity;
- e. Treat an individual differently from others in determining whether the individual satisfies any admission, enrollment, eligibility, membership, or other requirement or condition which the individual must meet in order to be provided any facilities, services or other benefit provided under the program or activity; and
- f. Deny an opportunity to participate in a program or activity as an employee.

CLEAN AIR ACT (2 CFR Appendix II to Part 200 (G))

Pursuant to 2 CFR Appendix II to Part 200 (G), if at any time during the contract term funding to contract exceeds \$150,000, the Contractor must comply with all provisions of the Clean Air Act (42 U.S.C. 85) and Section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended. Contractors securing a contract in excess of \$150,000.00 shall not expend such funds by making use of subcontracting with facilities included on the Environmental Protection Agency List of Violating Facilities as per Section 306 of the Clean Air Act, Section 508 of The Clean Water Act, Executive Order 11738, and Environmental Protection Agency Regulations 40 CFR. For any subcontractors under this contract receiving contracts in excess of \$150,000 Contractor is required to include a provision that requires compliance with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 85) and Section 308 Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

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CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (2 CFR Appendix II to Part 200 (E))

Pursuant to 2 CFR 200 Appendix II (E), if at any time during the contract term funding to contract exceeds \$100,000, the Contractor must comply with the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence

- (1) Overtime Requirements – No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.
- (3) Withholding for unpaid wages and liquidated damages. The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.

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COPELAND “ANTI-KICKBACK” ACT (40 U.S.C. 3145)

Pursuant to 2 CFR Appendix II to Part 200 (D), Contractor must comply with the provisions of the Copeland “Anti-Kickback” Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each vendor, contractor, subcontractor, or subrecipient shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. Contractor shall include this provision in all contracts between itself and any subcontractors in connection with the services performed under this Contract. Galveston County shall report all suspected or reported violations to the Federal awarding agency.

COST PLUS CONTRACTING PROHIBITED (2 CFR 200.323(D))

Cost-plus-a-percentage-of-cost (CPPC) contracts are prohibited by 2 CFR 200.323(d). The cost plus a percentage of cost and percentage of construction cost methods of contracting must never be used, including in subcontracts and third-party contracts. A cost-plus contract is one that is structured to pay the contractor or subcontractor their actual costs incurred, plus a fixed percent for profit or overhead.

A cost-plus-a-percentage-of-cost (CPPC) contract is a contract containing some element that obligates Galveston County or Contractor to pay a contractor or subcontractor an amount (in the form of either profit or cost), undetermined at the time the contract was made, to be incurred in the future, and based on a percentage of future costs. The inclusion of an overall contract ceiling price does not make these forms of contracts acceptable. This type of contract is prohibited because there is no incentive for the contractor or subcontractor to keep its incurred costs low. Instead, there is a reverse incentive for the contractor or subcontractor to continue to incur additional costs in order to continue to drive the percentage of cost up. In other words, increased spending by the contractor will yield higher profits. This prohibition applies to all work, regardless of the circumstances, and applies to subcontracts of the contractor cases where the prime contract is a cost-reimbursement type contract or subject to price redetermination.

DAVIS BACON AND RELATED ACTS (2 CFR 200 APPENDIX II (D))

Pursuant to 2 CFR 200 Appendix II (D), for any contract in excess of \$2,000, Contractor must comply with the Davis Bacon and Related Acts, and the requirements shall be applicable to any labor or mechanic work completed in connection with this contract which fall under the Davis Bacon Act. Any Contractor awarded under this contract is required to comply with the Davis Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR part 5) and with the Copeland “Anti-Kickback” Act (18 U.S.C. 874; 40 U.S.C. 3145) as supplemented in Department of Labor regulations (29 CFR part 3). In accordance with the statute, Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week.

If Davis Bacon is applicable, Galveston County will provide a copy of the current Davis Bacon Wage Decision with the solicitation. The decision to award a contract or subcontract shall be conditioned upon the acceptance of the wage determination. Contractor shall submit certified payroll of contractor and all subcontractors on a weekly basis in the format required by the County. At County’s request, Contractor shall make available and shall require its subcontractors to make available, copies of cancelled checks and check stubs for comparisons by the County or its agents.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a)(1)(ii)) and the Davis Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

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Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following. The Statement of Compliance can be found on page 2 of the WH-347 form, and/or additional certifications of compliance may be required by Galveston County. Any Statement of Compliance is subject to the penalties provided by 18 U.S.C. § 1001, namely, a fine, possible imprisonment of not more than 5 years, or both. Accordingly, the party signing the statement should have knowledge of the facts represented as true. Contractor must include this provision in all contracts between itself and any subcontractors in connection with the services performed under this Contract. Galveston County shall report all suspected or reported violations to the Federal awarding agency, as applicable.

DEBARMENT / SUSPENSION AND VOLUNTARY EXCLUSION (2 CFR Appendix II to Part 200 (I))

Pursuant to 2 CFR Appendix II to Part 200 (I), a Contract meeting the definition in 2 C.F.R. § 180.220 must not be made to parties listed on the System for Award Management (SAM) Exclusion lists, in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

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

Additionally, no contracts shall be awarded to any Contractor that has been debarred, suspended, or otherwise excluded from or ineligible for participation in any federal programs, including but not limited to the Department of Health and Human Work (DHHS), Office of Inspector General (OIG) - List of Excluded Individuals & Entities (LEIE); U.S. General Services Administration (GSA) – Excluded Parties List System (EPLS); All States (50) Health & Human Work Commission Medicaid OIG Sanction List; Government Terrorist Watch List (OFAC / Patriot Act); Department of Commerce, Bureau of Industry and Security, Denied Persons List; and Department of Homeland Security, Immigration and Customs Enforcement (ICE) Most Wanted.

This contract is a covered transaction for purposes of compliance with Title 2 C.F.R. parts 180 and 3000, and as such the Contractor is required to verify that none of the contractor, its principals (as defined at 2 C.F.R. § 180.995), or its affiliates (as defined at 2 C.F.R. § 180.905) are excluded (as defined at 2 C.F.R. § 180.940) or disqualified (as defined at 2 C.F.R. § 180.935). These regulations restrict awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs and activities (See 2 C.F.R Part 200, Appendix II). The Contractor must comply with 2 C.F.R. part 180, subpart C and 2 C.F.R. part 3000, subpart C and shall include this requirement and similar certification in all contracts between itself and any subcontractors in connection with the services performed under this Contract.

The Contractor confirms that it is eligible or otherwise not disqualified or prohibited from participation in federal or state assistance programs under Executive Order 12549, Debarment and Suspension. Additionally, the Contractor warrants that it is not debarred, suspended, or otherwise excluded from or ineligible for participation in any federal programs, including but not limited to the following: Department of Health and Human Work (DHHS), Office of Inspector General (OIG) - List of Excluded Individuals & Entities (LEIE); U.S. General Services Administration (GSA) – Excluded Parties List System (EPLS); All States (50) Health & Human Work Commission Medicaid OIG Sanction List; Government Terrorist Watch List (OFAC / Patriot Act); Department of Commerce, Bureau of Industry and Security, Denied Persons List; and Department of Homeland Security, Immigration and Customs Enforcement

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(ICE) Most Wanted. Galveston County reserves the right to verify any contractor's status and document instances of debarment, suspension, or other ineligibility.

Contractor shall verify that all subcontractors performing work under this Contract are not debarred, disqualified, or otherwise prohibited from participation in accordance with the requirements above. The Contractor further must notify Galveston County in writing immediately if Contractor or its subcontractors are not in compliance with Executive Order 12549 during the term of this contract. Contractor shall include this provision in all contracts between itself and any subcontractors in connection with the services performed under this Contract.

If it is found that the Contractor did not comply or is not in compliance with Executive Order 12549 (2 C.F.R. part 180, subpart C and 2 C.F.R. part 3000, subpart C), the Contractor may be subject to available remedies, including but not limited to, refunding Galveston County for any payments made to the Contractor while ineligible, and also acknowledges that the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

EQUAL EMPLOYMENT OPPORTUNITY (41 CFR 60-1.4(b) and 2 CFR 200 APPENDIX II (C))

Contractor must comply with, and incorporate or cause to be incorporated into any contract for construction work, or modification thereof, the Equal Employment Opportunity provisions as follows:

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

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5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
6. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The Contractor further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The Contractor agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The Contractor further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the Contractor agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the Contractor under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such Contractor; and refer the case to the Department of Justice for appropriate legal proceedings. Contractor must include the equal opportunity clause in each of its nonexempt subcontracts, and to require all non-exempt subcontractors to include the equal opportunity clause in each of its nonexempt subcontracts.

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EQUAL EMPLOYMENT OPPORTUNITY FOR WORKERS WITH DISABILITIES (48 CFR 52.22236)

During the performance of this contract, the Contractor must comply with required Equal Employment Opportunity for Workers with Disabilities provisions.

Contractor shall include the following equal opportunity clause in each of its covered Government contracts or subcontracts (and modifications, renewals, or extensions thereof if not included in the original contract):

- a. Equal opportunity clause. The Contractor shall abide by the requirements of the equal opportunity clause at 41 CFR 60-741.5(a), as of March 24, 2014. This clause prohibits discrimination against qualified individuals on the basis of disability and requires affirmative action by the Contractor to employ and advance in employment qualified individuals with disabilities.
- b. Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of \$15,000 unless exempted by rules, regulations, or orders of the Secretary, so that such provisions will be binding upon each subcontractor or vendor. The Contractor shall act as specified by the Director, Office of Federal Contract Compliance Programs of the U.S. Department of Labor, to enforce the terms, including action for noncompliance. Such necessary changes in language may be made as shall be appropriate to identify properly the parties and their undertakings.

EQUAL EMPLOYMENT OPPORTUNITY FOR VEVRAA PROTECTED VETERANS (41 CFR 60.300)

Galveston County is an equal opportunity employer of protected veterans. During the performance of this contract, the Contractor must comply with required Equal Employment Opportunity for VEVRAA Protected Veterans provisions.

Contractor shall include the following equal opportunity clause in each of its covered Government contracts or subcontracts (and modifications, renewals, or extensions thereof if not included in the original contract):

- a. The definitions set forth in 41 CFR 60-300.2 apply to the terms used throughout this Clause, and they are incorporated herein by reference.
- b. The contractor shall not discriminate against any employee or applicant for employment because he or she is a disabled veteran, recently separated veteran, active-duty wartime or campaign badge veteran, or Armed Forces service medal veteran (hereinafter collectively referred to as "protected veteran(s)") in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals without discrimination based on their status as a protected veteran in all employment practices, including the following:
 - i Recruitment, advertising, and job application procedures.
 - ii Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring.
 - iii Rates of pay or any other form of compensation and changes in compensation.
 - iv Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists.
 - v Leaves of absence, sick leave, or any other leave.
 - vi Fringe benefits available by virtue of employment, whether or not administered by the contractor.

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- vii Selection and financial support for training, including apprenticeship, and on-the-job training under 38 U.S.C. 3687, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training.
 - viii Activities sponsored by the contractor including social or recreational programs.
 - ix Any other term, condition, or privilege of employment.
- c. The contractor shall immediately list all employment openings which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the contractor other than the one where the contract is being performed, but excluding those of independently operated corporate affiliates, with the appropriate employment service delivery system where the opening occurs. Listing employment openings with the state workforce agency job bank or with the local employment service delivery system where the opening occurs will satisfy the requirement to list jobs with the appropriate employment service delivery system. In order to satisfy the listing requirement described herein, contractors must provide information about the job vacancy in any manner and format permitted by the appropriate employment service delivery system which will allow that system to provide priority referral of veterans protected by VEVRAA for that job vacancy. Providing information on employment openings to a privately run job service or exchange will satisfy the contractor's listing obligation if the privately run job service or exchange provides the information to the appropriate employment service delivery system in any manner and format that the employment service delivery system permits which will allow that system to provide priority referral of protected veterans.
- d. Listing of employment openings with the appropriate employment service delivery system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicants or from any particular group of job applicants, and nothing herein is intended to relieve the contractor from any requirements in Executive orders or regulations regarding nondiscrimination in employment.
- e. Whenever a contractor, other than a state or local governmental contractor, becomes contractually bound to the listing provisions in paragraphs 2 and 3 of this clause, it shall advise the employment service delivery system in each state where it has establishments that: (a) It is a Federal contractor, so that the employment service delivery systems are able to identify them as such; and (b) it desires priority referrals from the state of protected veterans for job openings at all locations within the state. The contractor shall also provide to the employment service delivery system the name and location of each hiring location within the state and the contact information for the contractor official responsible for hiring at each location. The "contractor official" may be a chief hiring official, a Human Resources contact, a senior management contact, or any other manager for the contractor that can verify the information set forth in the job listing and receive priority referrals from employment service delivery systems. In the event that the contractor uses any external job search organizations to assist in its hiring, the contractor shall also provide to the employment service delivery system the contact information for the job search organization(s). The disclosures required by this paragraph shall be made simultaneously with the contractor's first job listing at each employment service delivery system location after the effective date of this final rule. Should any of the information in the disclosures change since it was last reported to the employment service delivery system location, the contractor shall provide updated information simultaneously with its next job listing. As long as the

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contractor is contractually bound to these provisions and has so advised the employment service delivery system, there is no need to advise the employment service delivery system of subsequent contracts. The contractor may advise the employment service delivery system when it is no longer bound by this contract clause.

- f. The provisions of paragraphs 2 and 3 of this clause do not apply to the listing of employment openings which occur and are filled outside of the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, Guam, the Virgin Islands, American Samoa, the Commonwealth of the Northern Mariana Islands, Wake Island, and the Trust Territories of the Pacific Islands.
- g. As used in this clause:
 - i. All employment openings include all positions except executive and senior management, those positions that will be filled from within the contractor's organization, and positions lasting three days or less. This term includes full-time employment, temporary employment of more than three days' duration, and part-time employment.
 - ii. Executive and senior management means: (1) Any employee (a) compensated on a salary basis at a rate of not less than \$455 per week (or \$380 per week, if employed in American Samoa by employers other than the Federal Government), exclusive of board, lodging or other facilities; (b) whose primary duty is management of the enterprise in which the employee is employed or of a customarily recognized department or subdivision thereof; (c) who customarily and regularly directs the work of two or more other employees; and (d) who has the authority to hire or fire other employees or whose suggestions and recommendations as to the hiring, firing, advancement, promotion or any other change of status of other employees are given particular weight; or (2) any employee who owns at least a bona fide 20-percent equity interest in the enterprise in which the employee is employed, regardless of whether the business is a corporate or other type of organization, and who is actively engaged in its management.
 - iii. Positions that will be filled from within the contractor's organization means employment openings for which no consideration will be given to persons outside the contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings which the contractor proposes to fill from regularly established "recall" lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of his or her own organization.
- h. The contractor shall comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
- i. In the event of the contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
- j. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, provided by or through the contracting officer. Such notices shall state the rights of applicants and employees as well as the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants who are protected veterans. The contractor must ensure that

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applicants or employees who are disabled veterans are provided the notice in a form that is accessible and understandable to the disabled veteran (e.g., providing Braille or large print versions of the notice, posting the notice for visual accessibility to persons in wheelchairs, providing the notice electronically or on computer disc, or other versions). With respect to employees who do not work at a physical location of the contractor, a contractor will satisfy its posting obligations by posting such notices in an electronic format, provided that the contractor provides computers that can access the electronic posting to such employees, or the contractor has actual knowledge that such employees otherwise are able to access the electronically posted notices. Electronic notices for employees must be posted in a conspicuous location and format on the company's intranet or sent by electronic mail to employees. An electronic posting must be used by the contractor to notify job applicants of their rights if the contractor utilizes an electronic application process. Such electronic applicant notice must be conspicuously stored with, or as part of, the electronic application.

- k. The contractor will notify each labor organization or representative of workers with which it has a collective bargaining agreement or other contract understanding that the contractor is bound by the terms of VEVRAA and is committed to take affirmative action to employ and advance in employment, and shall not discriminate against, protected veterans.
- l. The contractor will include the provisions of this clause in every subcontract or purchase order of \$100,000 or more, unless exempted by the rules, regulations, or orders of the Secretary issued pursuant to VEVRAA so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Director, Office of Federal Contract Compliance Programs, may direct to enforce such provisions, including action for noncompliance.
- m. The contractor must, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to their protected veteran status.
- n. The Contractor shall forfeit as a penalty to the County who administers the subject Project receiving Federal assistance, Sixty Dollars (\$60.00) for each worker, employed for each calendar day, or a portion thereof, such worker is paid less than the said stipulated rates for any work done under this Project, by him/her or by any contractor under him/her.
- o. All contractors shall keep, or cause to be kept, an accurate record showing the names of all workers, also the actual per diem wages paid to each of such workers.

FAIR LABOR STANDARDS ACT

Contractor must comply the Fair Labor Standards Act of 1938 (29 U.S.C. Section 201 et seq.) as now or hereafter amended, which regulates wage, hour and other employment practices that govern the use of funds provided and the employment of personnel under this contract. The Contractor warrants that it will pay all its workers all monies earned by its workers including, but not limited to regular wages, any overtime compensation, or any additional payments pursuant to the Fair Labor Standards Act, 29 United States Code (U.S.C.) Section 207 9a(1), as amended; the Texas Pay Day Act; the Equal Pay Act; Title VII of the Civil Rights Act of 1964, 42 U.S.C. Section 2000, et al., as amended; or any provisions of the Texas Labor Code Ann., as amended.

FLOOD DISASTER PROTECTION ACT OF 1973 (24 CFR 570.605)

Contractor must comply with the provisions in 24 CFR 570.605, Section 202(a) of the Flood Disaster Protection Act of 1973 (42 U.S.C. 4106), and the regulations in 44 CFR Parts 59-79.

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GREEN BUILDING STANDARDS

At a minimum, Contractors and subcontractors must comply with local codes and any applicable national building codes for any work involving rehabilitation or construction, including design. When a contract is funded, in whole or in part, by HUD funding, Contractors must comply with applicable Green Building standards to the maximum extent feasible. Green Building standards may apply to single-family properties, multifamily properties, or both and may include, but are not limited to best practices defined under LEED, Enterprise Green Communities, or NAHB National Green Building Standards and may include specific measures for water conservation, energy efficiency, and indoor air quality. Contractor and subcontractors must comply with the following standards, as applicable:

- 2009 ICC International Energy Conservation Code (IECC)
- ASHRAE 90.1-2007, which sets minimum energy standards for buildings except low-rise residential buildings
- ASHRAE 62.1-2010 and 62.2-2010, which set minimum standards for ventilation for indoor air quality for common areas in mid- and high-rise buildings, and low-rise residential buildings, respectively.
- New or replacement residential housing, when funded by CDBG-DR grants, must adhere to Green Building standards, including Energy Star Certified Homes or Energy Star for Multifamily High Rise and other applicable green building requirements.
- Moderate residential housing rehabilitation, when funded by CDBG-DR grants, must comply with the Community Planning & Development (CPD) Retrofit Checklist and provide Energy Star appliances, Water Sense or FEMP products if replaced.
- New or replacement residential housing, when funded by CDBG-DR grants, must adhere to Green Building standards, including Energy Star Certified Homes or Energy Star for Multifamily High Rise and other applicable green building requirements.

HOLD HARMLESS AGREEMENT

Contractor shall indemnify, defend, and hold harmless Galveston County from all claims for personal injury, death and/or property damage resulting directly or indirectly from contractor's performance. Contractor shall procure and maintain, with respect to the subject matter of this Request for Proposals, appropriate insurance coverage including, at a minimum, public liability and property damage with adequate limits to cover contractor's liability as may arise directly or indirectly from work performed under terms of this Request for Proposals. Certification of such coverage must be provided to the County upon request.

The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

LEAD-BASED PAINT (24 CFR 570.608)

Contractor and subcontractors must comply with the provisions found in 24 CFR 570.608, the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846), the Residential Lead Based Paint Hazard Reduction Act of 1992 (U.S.C. 4851-4856, and 24 CFR Part 35, subparts A, B, J, K, and R. This Article 2(f) is to be included in all subcontracts, for work in connection with this Contract, which relate to residential structures.

NON-COLLUSION (The Sherman Act)

Contractor must comply with the requirements of The Sherman Act, which prohibit collusion. Collusion occurs when two persons or representatives of an entity or organization make an agreement to deceive or mislead another. Such agreements are usually secretive and involve fraud or gaining an unfair advantage over a third party, competitors, consumers or others with whom they are negotiating. The collusion, therefore, makes the bargaining process inherently unfair. Collusion can involve promises of future benefits, price or wage fixing, kickbacks, or misrepresenting the independence of the relationship between the colluding parties.

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The Sherman Act prohibits any agreement among competitors to fix prices, rig bids, or engage in other anticompetitive activity. Collusion, bid rigging, or other anticompetitive activity is considered a felony. Contractor shall not in any way, directly or indirectly:

- a. Collude, conspire, or agree with any other person, firm, corporation, Proposer or potential Proposer to the amount of this Bid or the terms or conditions of this Bid.
- b. Pay or agree to pay any other person, firm, corporation Proposer or potential Proposer any money or anything of value in return for assistance in procuring or attempting to procure a contract or in return for establishing the prices in the attached Bid or the Bid of any other Proposer.
- c. Assemble in coordination with any other organization in an attempt to fix the price of the work.

Contractors are expected to report any suspected fraud, collusion, or impropriety from the inception of solicitation through the end of the contract term.

NON-SEGREGATED FACILITIES

“Prohibition of Segregated Facilities”

- a. Segregated facilities means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

Sexual orientation has the meaning given by the Department of Labor's Office of Federal Contract Compliance Programs and is found at www.dol.gov/ofccp/LGBT/LGBT_FAQs.html.

- b. The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.
- c. The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

PARTICIPATION BY MINORITY & WOMEN-OWNED BUSINESS ENTERPRISES (2 CFR 200.321)

Contractor must comply with the Minority and Women-owned Business Enterprise participation requirements under 2 CFR 200.321. Contractors must take all affirmative steps necessary to subcontract with Minority and Women-owned Business Enterprises (MWBES) to assure that MWBES are used when possible. These affirmative steps shall include:

- A. Placing qualified small and minority businesses and women’s business enterprises on solicitation lists;
- B. Assuring that small and minority businesses, and women’s business enterprises are solicited whenever they are potential sources;
- C. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women’s business enterprises;

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- D. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; and
- E. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

The State of Texas maintains a Historically Underutilized Business Program, which identifies any business at least 51 percent owned by an Asian Pacific American, Black American, Hispanic American, Native American, American woman and/or Service-Disabled Veteran, who resides in Texas and actively participate in the control, operations and management of the entity's affairs as a Historically Underutilized Business (also considered MWBE). Contractors who wish to check the status of a firm may visit <https://comptroller.texas.gov/purchasing/vendor/hub/>.

Contractors and subcontractors are required to facilitate Minority & Women-Owned Business Enterprise participation. Contractors are encouraged to utilize MWBEs / HUB firms as subcontractors, subconsultants, or suppliers in order to comply with the requirements and may check for firms who perform relevant work by searching <https://comptroller.texas.gov/purchasing/vendor/hub/>.

Contractor and subcontractors must facilitate Minority & Women-Owned Business Enterprise participation and take all affirmative steps to utilize MWBEs / HUB firms as subcontractors, subconsultants, or suppliers throughout the life of the Contract.

POTENTIAL CONFLICTS OF INTEREST

Pursuant to 2 CFR 200.112, Contractor must comply with disclosure requirements in accordance with Texas Local Government Code, Chapter 176. Contractor shall not use funds to directly or indirectly pay any person for influencing or attempting to influence any public employee or official in connection with the awarding of any contract or the extension, continuation, renewal, amendment or modification of any contract. By law, the Conflict of Interest Questionnaire (provided by the Texas Ethics Commission at www.ethics.state.tx.us) must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the Contractor becomes aware of facts that require the statement to be filed.

This law requires persons desiring to do business with the County to disclose any gifts valued in excess of \$250 given to any County Official or the County Official's family member, or employment of any County Official or the County Official's family member during the preceding twelve (12) month period. The disclosure questionnaire must be filed with the Galveston County Clerk. Refer to Texas Local Government Code, Chapter 176 for the details of this law.

An outside consultant or contractor is prohibited from submitting a bid for services on a Galveston County project of which the consultant or contractor was a designer or other previous contributor, or was an affiliate, subsidiary, joint venture or was in any other manner associated by ownership to any party that was a designer or other previous contributor. If such a consultant or contractor submits a prohibited bid, that bid shall be disqualified on the basis of conflict of interest, no matter when the conflict is discovered by Galveston County.

PREVAILING WAGES (2 CFR 200 APPENDIX II (D) and TGC 2258)

Pursuant to 2 CFR 200 Appendix II (D), Contractor must comply with Texas Government Code (TGC) 2258, Prevailing Wage Rates. Accordingly, Contractor must submit a certified payroll records as required, and compensate any worker employed on a public works project not less than as applicable. As noted under "Davis Bacon and Related Acts", when required by Federal program legislation, construction contracts in excess of \$2,000 awarded by Galveston County shall require compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, Contractor must

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pay wages to laborers and mechanics at a rate not less than the local prevailing wages, or Davis Bacon wages, as applicable. If both Texas prevailing wages and Davis Bacon provide rates for a particular class, Contractors must pay the greater wage rate. In addition, Contractor must pay wages not less than once a week.

In compliance with Section 2258 of the Texas Government Code, Contractor and any subcontractor hired by Contractor for the construction of any project, shall pay not less than the rates set forth in the Schedule of Prevailing Wages attached and incorporated by reference. In submitting a Bid, Contractor warrants that it and its subcontractors shall comply with all requirements and worker ratios per the applicable Schedule of Prevailing Wages and Texas state law.

Contractor must submit certified payroll of contractor and all subcontractors on a weekly basis. At County's request, Contractor must make available and shall require its subcontractors to make available, copies of cancelled checks and check stubs for comparisons by the County or its agents. Regardless of whether Davis Bacon or Texas Prevailing Wages apply, the County reserves the right for its agents to visit the project site and to interview contractor, its subcontractors and employees of each on any date or time, as often as desired during the construction period, without prior notification.

Galveston County will ascertain if proper wage rates are being paid to the employees as required. In the event of a discrepancy between the work performed and the wages paid, the County shall document same and notify Contractor. If, for any length of time and as determined by Galveston County, discrepancies appear between the certified payrolls and the actual wage paid, the County shall require check stubs to be attached to each weekly certified payroll. Pursuant to Texas Government Code Section 2258.051, the County reserves the right to withhold any monies due Contractor until such discrepancy is resolved and the necessary adjustment made. The Contractor shall forfeit as a penalty, in accordance with Texas Government Code Section 2258.023(b), to the County or entity who administers the subject Project receiving Federal assistance, Sixty Dollars (\$60.00) for each worker, employed for each calendar day, or a portion thereof, such worker is paid less than the said stipulated rates for any work done under this Project, by him/her or by any contractor/subcontractor under him/her.

All contractor/subcontractor shall keep, or cause to be kept, an accurate record showing the names of all workers, also the actual per diem wages paid to each of such workers. Contractor shall impose these same obligations upon its Subcontractors. Contractor understands that with weekly or monthly certified payrolls, contractor is responsible for any and all penalties that shall accrue during the month, regardless of the fact that any error could not be discovered by the Contract Compliance Officer until the following certified payroll.

PROCUREMENT OF RECOVERED MATERIALS (2 CFR 200.322)

Pursuant to 2 CFR 200.322, Contractor must comply with Section 6002 of the Solid Waste Disposal Act, Pub. L. No. 89-272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962). As such, any contractors awarded under this contract opportunity is subject to the requirements of Section 6002, which include procuring only items designated in guidelines of the EPA at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired by the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

Contractor must comply with 31 U.S.C. Chapter 38, Administrative Remedies for False Claims and Statements, which shall apply to the activities and actions of the Contractor and its subcontractors pertaining to any matter resulting from the contract.

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RESTRICTIONS ON PUBLIC BUILDINGS AND PUBLIC WORKS PROJECTS CERTIFICATION

- b. Definitions. The definitions pertaining to this provision are those that are set forth on the clause entitled “Restrictions on Public Works Projects.” (Set out under “Contract Clauses” below.)
- c. Certification. Except as provided in paragraph (C) of this provision, by submission of its bid or proposal, Proposer certifies that it:
 - i. Is not a Contractor of a foreign country included on the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR) (see paragraph (H) of this provision);
 - ii. Has not or will not enter into any subcontract with a subcontractor of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR, and
 - iii. Will not provide any product of a country included on the list of foreign countries that discriminate against the U.S. firms published by the USTR.
- d. Inability to certify. A Proposer unable to certify in accordance with paragraph (b) of this provision shall submit with its offer a written explanation fully describing the reasons for its inability to make the certification.
- e. Applicability of 18 U.S.C. 1001. This certification is paragraph (B) of this provision concerns a matter within the jurisdiction of an agency of the United States, and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 U.S.C. 1001.
- f. Notice. Proposer shall provide written notice to the Contracting Officer if, at any time before the contract award, Proposer learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- g. Restrictions on contract award. Unless a waiver to these restrictions is granted by the Secretary of Housing and Urban Development, no contract will be awarded to a Proposer (1) who is owned or controlled by a citizen or national of a foreign country included on the list of foreign countries that discriminate against U.S. firms published by the USTR, (2) whose subcontractors are owned or controlled by citizens or national of a foreign country on the USTR list or, (3) who incorporates any product of a foreign country on the USTR list in the public works project.
- h. USTR List. The USTR published an initial list in the Federal Register on December 30, 1987 (53 FR 49244), which identified one country-Japan. The USTR can add countries to the list, and remove countries from it, in accordance with section 109 (C) of PUB. L. 100-202.

RESTRICTIONS ON PUBLIC BUILDINGS AND PUBLIC WORKS PROJECTS

- a. Definitions. “Component”, as used in this clause, means those articles, materials, and supplies incorporated directly into the product. “Contractor or subcontractor of a foreign country,” as used in this clause, means any Contractor or subcontractor that is a citizen or national of a foreign country or is controlled directly or indirectly by citizens or nationals of a foreign country. A contractor or subcontractor shall be considered to be a citizen or national of a foreign country, or controlled directly or indirectly by citizens or nationals of a foreign country:

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- i. If 50 percent or more of the Contractor or subcontractor is owned by a citizen or a national of the foreign country;
 - ii. If the title to 50 percent or more of the stock of the Contractor or subcontractor is held subject to trust or fiduciary obligation in favor of citizens or nationals of the foreign country.
 - iii. If 50 percent or more of the voting power in the Contractor or subcontractor is vested in or exercisable on behalf of a citizen or national of the foreign country; iv. In the case of a partnership, if any general partner is a citizen of the foreign country;
 - v. In the case of a corporation. If its presidents or other chief executive officer or the chairman of its board of directors is a citizen of the foreign country or the majority of any number of its directors necessary to constitute a quorum are citizens of the foreign country or the corporation is organized under the laws of the foreign country or any subdivision, territory, or possession thereof; or
 - vi. In case of a contractor or subcontractor who is a joint venture, if any participant firm is a citizen or national of a foreign country or meets any of the criteria in subparagraphs (A) 1 through 5 of this clause. "Product", as used in this clause, means construction materials, i.e. articles, materials and supplies brought to the construction site for incorporation into the public works project, including permanently affixed equipment, instruments, utilities, electronic or other devices, but not including vehicles or construction equipment. In determining the origin of a product, Galveston County will consider a product as produce in a foreign country if it has been assembled or manufactured in the foreign country, or if the cost of the components mined, produced, or manufactured in the foreign country exceed 50 percent of the cost of all its components.
- b. Restrictions. The Contractor shall not (1) knowingly enter into any subcontract under this contract with a subcontractor of a foreign country included on the list of countries that discriminate against U.S. firms published by the United States Trade Representative (see paragraph (C) of this clause, or (2) supply any product under this contract of a country included on the list of foreign countries that discriminate against U.S. firms published by the USTR.
- c. USTR List. The USTR published an initial list in the Federal Register on December 30, 1987 (53 FR 49244), which identified one country-Japan. The USTR can add other countries to the list, or remove countries from it, in accordance with section 109 (C) of PUB. L. 100-102.
- d. Certification. The Contractor may rely upon the certification of a prospective subcontractor that it is not a subcontractor of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR and that products supplied by such subcontractor for use on the Federal public works project under this contract are not products of a foreign country included on the list of foreign countries that discriminate against U.S. firms published by the USTR, unless such Contractor has knowledge that the certification is erroneous.
- e. Subcontractors. The Contractor shall incorporate this clause, modified only for the purpose of properly identifying the parties, in all subcontracts. This paragraph (E) shall also be incorporated in all subcontracts.

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RIGHTS TO INVENTIONS (2 CFR Appendix II to Part 200 (F))

Any discovery or invention that arises during the course of the contract shall be reported to Galveston County. This clause requires the Contractor to disclose promptly inventions to the County (within 2 months) after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The awarding agency shall determine how rights in the invention/discovery shall be allocated consistent with "Government Patent Policy" and Title 37 C.F.R. § 401.

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

SECTION 109 OF THE HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1974 (24 CFR 570.602)

Section 109 of the Act requires that no person in the United States shall on the grounds of race, color, national origin, religion, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance made available pursuant to the Act. Section 109 also directs that the prohibitions against discrimination on the basis of age under the Age Discrimination Act and the prohibitions against discrimination on the basis of disability under Section 504 shall apply to programs or activities receiving Federal financial assistance under Title I programs. The policies and procedures necessary to ensure enforcement of section 109 are codified in 24 CFR part 6.

TERMINATION FOR CAUSE & CONVENIENCE (2 CFR Appendix II to Part 200 (A) and (B))

Pursuant to 2 CFR Appendix II to Part 200 (A), Contracts for more than the simplified acquisition threshold currently set at \$150,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, shall address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

Pursuant to 2 CFR Appendix II to Part 200 (B), all contracts in excess of \$10,000 shall address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement. Galveston County shall have the right to terminate this contract for cause and convenience.

In the event of a failure by Contractor to satisfactorily perform the services specified herein and/or a default by Contractor in abiding by the other terms and conditions of this Contract, Galveston County may terminate the Contract on written notice to Contractor and Contractor shall be liable for all damages, costs, and expenses (including attorney fees) incurred by County related to this default. Such termination is in addition to and not in lieu of any other remedies that Galveston County may have in law or equity. Administrative remedies for nonperformance, violation or breach of contract terms, or termination of contract for default may include suspension and debarment. Galveston County may assess liquidated damages for failure to meet completion deadlines, contract breaches, or performance failures of the Contractor or its Subcontractors.

Contractor shall be provided the opportunity to cure certain performance failures or instances of default as described in the contract documents. The legal dispute resolution process as applicable under the Texas Civil Practice and Remedies Code shall include, but is not limited to, Texas and Civil Practice and Remedies Section 38 – Attorney’s Fees, Texas Civil Practice and Remedies Section 41 – Damages, and Texas Civil Practice and Remedies Section 154 – General Provisions. Galveston County and Contractor(s) should attempt to resolve any claim for breach of contract made by Contractor, to the extent it is applicable to the Contract and not preempted by other law. Except as otherwise provided by law, nothing herein is a waiver by the County or the State of Texas of the right to seek redress in a court of law.

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Termination provisions are included in the Contract Requirements & Payment, Section VIII, portion of this IFB.

WHISTLEBLOWER PROTECTION ACT

Contractor, subcontractors, and employees working on this Project shall be subject 41 U.S. Code § 4712, which requires that an employee of a contractor, subcontractor, grantee, or subgrantee or personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant.

The Contractor shall inform its employees and subcontractors in writing, in the predominant language of the workforce, of employee whistleblower rights and protections under 41 U.S.C. 4712, as described in section 3.908 of the Federal Acquisition Regulation. The Contractor shall insert the substance of this clause, including this paragraph, in all subcontracts providing services for this Project.

72. NON-EXCLUSIVE LIST OF APPLICABLE LAWS, RULES, AND REGULATIONS – TEXAS GENERAL LAND OFFICE (GLO)

If applicable to the Project, Provider must be in compliance with the following laws, rules, and regulations; and any other state, federal, or local laws, rules, and regulations as may become applicable throughout the term of the Contract, and Provider acknowledges that this list may not include all such applicable laws, rules, and regulations. Provider and is deemed to have read and understands the requirements of each of the following, if applicable to the Project under this Contract:

GENERALLY

The Acts and Regulations specified in this Contract;

Continuing Appropriations Act, 2018 and Supplemental Appropriations for Disaster Relief Requirements Act, 2017 (Public Law 115-56);

The Housing and Community Development Act of 1974 (12 U.S.C. § 5301 et seq.);

The United States Housing Act of 1937, as amended, 42 U.S.C. § 1437f(o)(13) (2016) and related provisions governing Public Housing Authority project-based assistance, and implementing regulations at 24 C.F.R. Part 983 (2016);

Cash Management Improvement Act regulations (31 C.F.R. Part 205);

Community Development Block Grants (24 C.F.R. Part 570);

Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (2 C.F.R. Part 200);

Disaster Recovery Implementation Manual; and State of Texas Plan for Disaster Recovery: Hurricane Harvey – Round 1, dated April 6,2018, as amended.

CIVIL RIGHTS

Title VI of the Civil Rights Act of 1964, (42 U.S.C. § 2000d et seq.); 24 C.F.R. Part 1, "Nondiscrimination in Federally Assisted Programs of the Department of Housing and Urban Development - Effectuation of Title VI of the Civil Rights Act of 1964";

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Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972 (42 U.S.C. § 2000e, et seq.);

Title VIII of the Civil Rights Act of 1968, "The Fair Housing Act of 1968" (42 U.S.C. §3601, et seq.), as amended;

Executive Order 11063, as amended by Executive Order 12259, and 24 C.F.R. Part 107, "Nondiscrimination and Equal Opportunity in Housing under Executive Order 11063"; The failure or refusal of Provider to comply with the requirements of Executive Order 11063 or 24 C.F.R. Part 107 shall be a proper basis for the imposition of sanctions specified in 24 C.F.R. 107.60;

The Age Discrimination Act of 1975 (42 U.S.C. § 6101, et seq.); and

Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794.) and "Nondiscrimination Based on Handicap in Federally-Assisted Programs and Activities of the Department of Housing and Urban Development", 24 C.F.R. Part 8. By signing this Contract, Provider understands and agrees that the activities funded shall be performed in accordance with 24 C.F.R. Part 8; and the Architectural Barriers Act of 1968 (42 U.S.C. § 4151, et seq.), including the use of a telecommunications device for deaf persons (TDDs) or equally effective communication system.

LABOR STANDARDS

The Davis-Bacon Act, as amended (originally, 40 U.S.C. §§ 276a-276a-5 and re-codified at 40 U.S.C. §§ 3141-3148); 29 C.F.R. Part 5;

The Copeland "Anti-Kickback" Act (originally, 18 U.S.C. § 874 and re-codified at 40 U.S.C. § 3145): 29 C.F.R. Part 3;

Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (originally, 40 U.S.C. §§ 327A and 330 and re-codified at 40 U.S.C. §§ 3701-3708);

Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (Also Labor Standards Provisions Applicable to Non-construction Contracts Subject to the Contract Work Hours and Safety Standards Act) (29 C.F.R. Part 5); and
Federal Executive Order 11246, as amended.

EMPLOYMENT OPPORTUNITIES

Section 3 of the Housing and Urban Development Act of 1968 (12 U.S.C. § 1701u): 24 C.F.R. §§ 135.3(a)(2) and (a)(3);

The Vietnam Era Veterans' Readjustment Assistance Act of 1974 (38 U.S.C. § 4212);

Title IX of the Education Amendments of 1972 (20 U.S.C. §§ 1681-1688); and

Federal Executive Order 11246, as amended.

GRANT AND AUDIT STANDARDS

Single Audit Act Amendments of 1996, 31 U.S.C. § 7501;

Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (2 C.F.R. Part 200);

Uniform Grant and Contract Management Act (Texas Government Code Chapter 783) and the Uniform Grant Management Standards, issued by Governor's Office of Budget and Planning; and

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Title 1 Texas Administrative Code § 5.167(c).

LEAD-BASED PAINT

Section 302 of the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. § 4831(b)).

HISTORIC PROPERTIES

The National Historic Preservation Act of 1966 as amended (16 U.S.C. § 470, et seq.), particularly sections 106 and 110 (16 U.S.C. §§ 470 and 470h-2), except as provided in §58.17 for Section 17 projects;

Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971 (36 FR 8921), 3 C.F.R., 1971-1975 Comp., p. 559, particularly section 2(c);

Federal historic preservation regulations as follows: 36 C.F.R. Part 800 with respect to HUD programs; and The Reservoir Salvage Act of 1960, as amended by the Archeological and Historic Preservation Act of 1974 (16 U.S.C. § 469, et seq.), particularly section 3 (16 U.S.C. §469a-1).

ENVIRONMENTAL LAW AND AUTHORITIES

Environmental Review Procedures for Recipients assuming HUD Environmental Responsibilities (24 C.F.R. Part 58, as amended);

National Environmental Policy Act of 1969, as amended (42 U.S.C. §§ 4321-4347); and Council for Environmental Quality Regulations for Implementing NEPA (40 C.F.R. Parts 1500-1508).

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION

Executive Order 11988, Floodplain Management, May 24, 1977 (42 FR 26951), 3 C.F.R., 1977 Comp., p. 117, as interpreted in HUD regulations at 24 C.F.R. Part 55, particularly Section 2(a) of the Order (For an explanation of the relationship between the decision-making process in 24 C.F.R. Part 55 and this part, see § 55.10.); and

Executive Order 11990, Protection of Wetlands, May 24, 1977 (42 FR 26961), 3 C.F.R., 1977 Comp., p. 121 particularly Sections 2 and 5.

COASTAL ZONE MANAGEMENT

The Coastal Zone Management Act of 1972 (16 U.S.C. § 1451, et seq.), as amended, particularly sections 307(c) and (d) (16 U.S.C. § 1456(c) and (d)).

SOLE SOURCE AQUIFERS

The Safe Drinking Water Act of 1974 (42 U.S.C. §§ 201, 300(f), et seq., and 21 U.S.C. §349) as amended; particularly section 1424(e)(42 U.S.C. § 300h-3(e)); and

Sole Source Aquifers (Environmental Protection Agency-40 C.F.R. part 149.).

ENDANGERED SPECIES

The Endangered Species Act of 1973 (16 U.S.C. § 1531, et seq.) as amended, particularly section 7 (16 U.S.C. § 1536).

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 (16 U.S.C. § 1271, et seq.) as amended, particularly sections 7(b) and (c) (16 U.S.C. § 1278(b) and (c)).

AIR QUALITY

The Clean Air Act (42 U.S.C. § 7401, et seq.) as amended, particularly sections 176(c) and (d) (42 U.S.C. §7506(c) and (d)).

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Determining Conformity of Federal Actions to State or Federal Implementation Plans
(Environmental Protection Agency-40 C.F.R. Parts 6, 51, and 93).

FARMLAND PROTECTION

Farmland Protection Policy Act of 1981 (7 U.S.C. § 4201, et seq.) particularly sections 1540(b) and 1541 (7 U.S.C. §§ 4201(b) and 4202); and

Farmland Protection Policy (Department of Agriculture-7 C.F.R. part 658).

HUD ENVIRONMENTAL STANDARDS

Applicable criteria and standards specified in HUD environmental regulations (24 C.F.R. Part 51)(other than the runway clear zone and clear zone notification requirement in 24 C.F.R. § 51.303(a)(3); and

HUD Notice 79-33, Policy Guidance to Address the Problems Posed by Toxic Chemicals and Radioactive Materials, September 10, 1979.

ENVIRONMENTAL JUSTICE

Executive Order 12898 of February 11, 1994—Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, (59 FR 7629), 3 C.F.R., 1994 Comp. p. 859.

SUSPENSION AND DEBARMENT

Use of debarred, suspended, or ineligible contractors or subrecipients (24 C.F.R. §570.609);

General HUD Program Requirements; Waivers (24 C.F.R. Part 5); and

Nonprocurement Suspension and Debarment (2 C.F.R. Part 2424).

OTHER REQUIREMENTS

Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 C.F.R. Part 58).

ACQUISITION / RELOCATION

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601, et seq.), 24 C.F.R. Part 42, and 24 C.F.R. § 570.606.

FAITH-BASED ACTIVITIES

Executive Order 13279 of December 12, 2002 - Equal Protection of the Laws for Faith-Based and Community Organizations, (67 FR 77141).

73. SPECIAL CONDITIONS – TEXAS GENERAL LAND OFFICE (GLO)

If applicable to a Project or Activity, Subrecipient must be in compliance with the following Special Conditions and any other State, Federal, or local laws, rules, and regulations as may be applicable, throughout the term of the Contract, prior to the release of any grant funds for the Projects or Activities anticipated.

Subrecipient is deemed to have read and to understand the requirements of each of the following, if applicable to the Project or any Activity under this Contract:

A. REIMBURSEMENT, GENERALLY

As provided for in Public Law 115-56, the Contract funds may not be used for activities that are eligible to be reimbursed by, or for which funds are made available by, (a) the Federal Emergency Management Agency (FEMA); (b) the Army Corps of Engineers (Corps); (c) any other federal funding source; or (d) covered by insurance, and Subrecipient shall ensure compliance with all such requirements.

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B. NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

- (1) Subrecipient must provide documentation which indicates they have received approval from the Texas Water Development Board (TWDB), the National Flood Insurance Program (NFIP) State Coordinating Agency, that appropriate ordinances or orders necessary for Subrecipient to be eligible to participate in the NFIP have been adopted.
- (2) Where Activities specified in a Performance Statement, involve structures that are located in Special Flood Hazard Areas (SFHA), flood insurance may be required, and Subrecipient shall obtain such insurance, and shall maintain documentation evidencing compliance with such requirements.
- (3) Subrecipient acknowledges and agrees that if any property that is the subject of an Activity under this Contract located within a floodplain, that the following terms and conditions shall apply:
 - a. Under the Flood Disaster Protection Act of 1973, as amended (42 U.S.C. 4001-4128), Federal financial assistance for acquisition and construction purposes (including rehabilitation) may not be used in an area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards, unless:
 - i. The community in which the area is situated is participating in the National Flood Insurance Program ("NFIP") (44 CFR parts 59 through 79), or less than one (1) year has passed since the FEMA notification regarding such hazards; and
 - ii. The community is participating in the NFIP, or that flood insurance protection is to be obtained as a condition of the approval of financial assistance to the property owner.
 - b. Where the community is participating in the NFIP and the recipient provides financial assistance for acquisition or construction purposes (including rehabilitation) for property located in an area identified by FEMA as having special flood hazards, Subrecipient is responsible for ensuring that flood insurance under the NFIP is obtained and maintained.
 - c. Under Section 582 of the National Flood Insurance Reform Act of 1994, 42 U.S.C. 515a, HUD disaster assistance that is made available in a special flood hazard area may not be used to make a payment (including any loan assistance payment) to a person for repair, replacement, or restoration for flood damage to any personal, residential, or commercial property if:
 - i. The person had previously received Federal flood disaster assistance conditioned on obtaining and maintaining flood insurance; and
 - ii. The person failed to obtain and maintain flood insurance.
 - d. Subrecipient understands and agrees that it has a responsibility to inform homeowners receiving disaster assistance that triggers the flood insurance purchase requirement of their statutory responsibility to notify any transferee of the requirement to obtain and maintain flood insurance, and that the transferring owner may be liable if he or she fails to do so.

C. PROJECT MAPPING/DESIGN INFORMATION

For construction projects, Subrecipient shall require and maintain copies, in written and/or digital format, of final Project record drawing(s) and engineering schematics, as constructed.

D. WATER SYSTEM IMPROVEMENTS

- (1) Prior to the GLO's release of funds for the construction of any water system improvements, Subrecipient shall provide certification to the GLO that plans, specifications, and related documents for the specified water system improvements have been prepared by the engineer selected for such activities, or the engineer's duly authorized representative, and that the review of such plans, specifications, and related documents meet the applicable Texas Commission on Environmental Quality (TCEQ) review requirements described in Title 30 of the Texas Administrative Code.

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- (2) Prior to construction, Subrecipient shall provide documentation to the GLO that an approved new or amended Certificate of Convenience and Necessity (CCN), or the equivalent permit or authority for the area to be served, has been issued by the TCEQ.
- (3) Prior to Subrecipient submission of the Project Completion Report for any water system improvements described in Attachment A, Subrecipient shall provide a letter from the TCEQ that the constructed well is approved for interim use and may be temporarily placed into service pursuant to 30 Texas Administrative Code, Chapter 290—Rules and Regulations for Public Water Systems.

E. SEWER SYSTEM IMPROVEMENTS

Prior to the construction of any sewer system improvements described, Subrecipient shall provide certification that plans, specifications, and related documents for the specified sewer system improvements have been prepared by the engineer selected for such activities, or the engineer's duly authorized representative, and that the review of such plans, specifications, and related documents meet the Texas Commission on Environmental Quality (TCEQ) review requirements described in 30 Texas Administrative Code, Chapter 217, Subchapter D.

Further, prior to the construction of any sewer lines or additional service connections described in Attachment A, Subrecipient shall provide notification of the start of construction on any sewer treatment plant of other system-related improvements included in this Contract.

F. WASTEWATER TREATMENT CONSTRUCTION

Prior to incurring costs for any wastewater treatment construction in Attachment A, Subrecipient shall provide documentation of an approved permit or amendment(s) to an existing permit for such activities from the TCEQ's Water Quality Division.

In addition, Subrecipient shall provide documentation to the GLO that an approved new or amended Certificate of Convenience and Necessity (CCN), or equivalent permit or authority for the area to be served has been issued by the TCEQ.

G. SEPTIC SYSTEM IMPROVEMENTS

- (1) Subrecipient shall provide documentation that final plans, specifications, and installation of its septic system improvements have been reviewed and approved by the City or County Health Department through authority granted by the TCEQ.
- (2) Subrecipient shall mitigate all existing septic systems in accordance with 30 Texas Administrative Code Chapter 285, Subchapter D, §285.36(b), which states, "All tanks, boreholes, cesspools, seepage pits, holding tanks, and pump tanks shall have the wastewater removed by a waste transporter, holding a current registration with the executive director. All tanks, boreholes, cesspools, seepage pits, holding tanks, and pump tanks shall be filled to ground level with fill material (less than three inches in diameter), which is free of organic and construction debris."
- (3) Prior to the selection of program recipients for proposed On-Site Sewer Facilities (OSSF), Subrecipient shall provide a copy of its proposed program guidelines to for GLO review. All proposed OSSF programs must meet or exceed guidelines set forth in 30 Texas Administrative Code Chapter 285 Subchapter D.

H. BUILDING CONSTRUCTION

Subrecipient shall provide documentation that the construction of a new building and facilities are in compliance with the Texas Accessibility Standards (TAS) of the Architectural Barriers Act, Chapter 469, Texas Government Code, and the Texas Department of Licensing and Regulation (TDLR) Architectural Barriers Administrative Rules, 16 Texas Administrative Code, Part 4, Chapter 68. If estimated construction costs exceed Fifty Thousand Dollars (\$50,000.00), Construction Documents must be submitted to the Texas Department of Licensing and Regulation (TDLR) for an accessibility plan review.

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I. BRIDGE CONSTRUCTION/REHABILITATION

Subrecipient shall use the minimum design requirements of the Texas Department of Transportation (TxDOT) for bridge construction/rehabilitation. Final plans and specifications must be submitted to TxDOT for review and approval prior to the start of construction, and documentation of such approval must be provided to the GLO.

J. DISASTER SHELTERS

Subrecipient shall ensure that the primary purpose of the facility, as described in Attachment A, is to serve as a disaster shelter, and shall ensure the facility is operated at all times in a manner that ensures that the priority use is to serve as a disaster shelter regardless of any other scheduled uses or commitments that existed at the time of the disaster or emergency situation. In addition, Subrecipient shall prepare or be incorporated into an approved emergency management plan, as prescribed by the Texas Division of Emergency Management, identifying the shelter as a facility that provides short-term lodging for evacuees during and immediately after an emergency situation. Subrecipient shall submit a copy of Subrecipient's Emergency Management Plan Annex for Shelter and Mass Care to the GLO.

K. DEBRIS REMOVAL

Subrecipient shall ensure that any debris to be removed consists primarily of vegetation, construction and demolition materials from damaged or destroyed structures, and personal property. Only debris identified as the responsibility of the local jurisdiction will be eligible for the reimbursement of cost of removal.

Prior to beginning debris collection operations, Subrecipient shall address all pertinent environmental concerns, adhere to all applicable regulations, and obtain all required permits. Further, Subrecipient shall adhere to the methods described herein for the collection and storage of debris prior to proper disposal.

While construction and demolition debris may be collected and disposed of at an appropriately rated landfill, woody and/or vegetative debris must be stored prior to disposal by use of temporary debris storage and reduction sites (TDSR). Subrecipient will prepare and operate the TDSR sites, or local jurisdictions choosing to conduct their own debris operations may review Chapter 7 of the FEMA Debris Management Guide regarding the use of TDSR sites. This document may be obtained <https://www.fema.gov/pdf/government/grant/pa/demagde.pdf>.

In order to maintain the life expectancy of landfills, Subrecipients disposing of woody and/or vegetative debris must choose burning, chipping, or grinding as the method of disposal. Any project disposing of woody and/or vegetative debris must be approved in writing by the GLO.

L. USE OF BONDS

Subrecipient must notify the GLO of its issuance and sale of bonds for completion of the project funded under this Contract.

M. PROGRAM GUIDELINES

Prior to the selection of program beneficiaries, Subrecipient shall provide to the GLO, for GLO review and approval, a copy of its proposed guidelines for the program. The guidelines must meet or exceed to requirements in the Federal Registers. The guidelines must include provisions for compliance with the Federal Fire Prevention and Control Act of 1974 (which requires that any housing unit rehabilitated with grant funds be protected by a hard-wired or battery-operated smoke detector) and provisions for compliance with 24 CFR 35 (HUD lead-based paint regulation).

N. AFFORDABILITY PERIODS FOR SINGLE-FAMILY HOUSING REHABILITATION, RECONSTRUCTION, OR NEW CONSTRUCTION ASSISTANCE:

For single-family non-rental housing assistance provided by Subrecipient, Subrecipient shall implement the following affordability period: for rehabilitation or reconstruction of housing projects, a minimum¹ three-year

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affordability period guaranteed by an unsecured forgivable promissory note and for new construction housing projects, a minimum five-year affordability period guaranteed by an unsecured forgivable promissory note.

O. UNSECURED FORGIVABLE PROMISSORY NOTE (“NOTE”)

An unsecured forgivable promissory note shall be issued at an interest rate of zero-percent (0%). Provided that all terms and conditions contained in the Note continue to be fulfilled, a Note will be forgiven according to the following terms, as applicable, until the applicant fulfills their note requirement (the requirements are defined in the promissory note document): for a three-year Note, at a rate of 33 percent per year, for the first two years, and 34 percent after the third year; and for a five-year Note, at a rate of 20% per year.

- (1) If the homeowner occupies the home for the full Note term, the Note expires and no repayment is required, nor will any conditions be imposed relative to the disposition of the property. If any of the terms and conditions under which the assistance was provided are breached or if the property is sold, leased, transferred, or vacated by the homeowner for any consecutive thirty (30) day period during the Note term, the repayment provisions of the promissory note and DOT shall be enforced.
- (2) If, during the Note term, the homeowner vacates the unit for any consecutive thirty (30) day period, the locality may forgive, as evidenced by the program director, city council, or commissioner court action, the remaining loan balance. Prior to forgiveness of all or any portion of the assistance provided, the request for forgiveness must be approved by the local governing body and be based on documented and justifiable conditions or circumstances that would result in an unnecessary hardship to the homeowner and the determination that the national objective of benefiting low to moderate-income persons was met.
- (3) The national objective will be considered met only when the program director, city council, or county commissioners court determines that a low- to moderate-income person has occupied the rehabilitated or reconstructed home for a time sufficient to meet the national objective. If the national objective was not achieved, Subrecipient is liable for repayment of an amount equal to the difference in the appraised value of the home prior to reconstruction and the sales price when the home is sold during the term of the forgivable Note.
- (4) If the property is sold or transferred to a person other than an eligible LMI person, the remaining pro-rated balance of the DPL must be repaid by the Subrecipient from the sales proceeds. Notwithstanding the preceding, Subrecipient shall be held liable for any balance remaining over and above the sales proceeds. In all instances, upon completion of the Note or repayment of the assistance (in full or in part), the Subrecipient shall prepare and record a release of lien document in the land records of the applicable county.
- (5) Monitoring of the Note is performed during and after the grant is closed. Subrecipient must utilize non-CDBG-DR funds to fulfill the monitoring obligations for its impacted recovered community.
- (6) The subrecipient will maintain a list of homeowners that do not maintain flood insurance as documented in their promissory note. These applicants will not be allowed to received future assistance as outlined in Section B of this document.

P. RENTAL HOUSING REHABILITATION, RECONSTRUCTION, OR NEW CONSTRUCTION ASSISTANCE

The rental housing assistance will provided be provided in the following forms: for rehabilitation or reconstruction of multi-family rental projects with eight or more units, a minimum fifteen (15) year forgivable loan or grant at zero interest; and for new construction multi-family rental projects with five or more units, a minimum twenty (20) year forgivable loan or grant at zero interest. Provided all terms and conditions under which the assistance was provided continue to be fulfilled, the note will be forgiven at a rate of 5 percent per year until the applicant fulfills their note requirement (the requirements are defined in the promissory note document).

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The purpose of the program is to facilitate the rehabilitation, reconstruction, and/or new construction of affordable rental housing needs within the service area of the disaster event. A minimum of 51% of the multi-family units must be restricted during the affordability period of twenty (20) years for low to moderate income (LMI) persons. The rents, at a minimum, must comply with High HOME Investment Partnership (HOME) Rents and other existing Land Use Restriction Agreement (LURA) restrictions if applicable. HOME rent limits are defined by HUD and must equal the lesser of fair market rents or 30% of the adjusted income for people earning 65% of the AMFI.

Q. COASTAL MANAGEMENT

Subrecipient acknowledges and agrees that any Project that may impact a Coastal Natural Resource Area must be consistent with the goals and policies of the Texas Coastal Management Program as described in 31 Texas Administrative Code, Part 16, Chapter 501.

74. ENERGY EFFICIENCY (42 U.S.C. 6201 and 2 CFR 200 APPENDIX II (H))

Contractor must comply with the mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201). Contractor must include this provision in all contracts between itself and any subcontractors in connection with the services performed under this Contract.

75. LEAD AND ASBESTOS

If this request for Proposal involves remediation, demolition, reconstruction, rehabilitation, repair, or construction, or other applicable activities, the Contractor shall be responsible for performing investigations of lead and asbestos containing materials, and any required lead and asbestos abatement in compliance with Federal, State, and local laws, rules, regulations, ordinances and orders, relating to lead abatement and asbestos abatement as applicable, including but not limited to the Texas Asbestos Health Protection Act, codified as Chapter 1954 of the Occupations Code; the Texas Asbestos Health Protection Regulations, located at Title 25, Part 1, Chapter 295, Subchapter C of the Texas Administrative Code; Chapter 1955 of the Texas Occupations Code (lead-based paint abatement); the Texas Environmental Lead Reduction regulations, located at Title 25, Part 1, Chapter 295, Subchapter I of the Texas Administrative Code; the federal National Emission Standards for Asbestos regulations, located at Title 40, Part 61, Subpart M of the Code of Federal Regulations, and the National Emission Standards for Hazardous Air Pollutants. Contractor shall perform such inspections, encapsulation, remediation, or other actions as required by federal, State, or local requirements in accordance with the federal Environmental Protection Agency (EPA), Texas Department of State Health Services (TXDSHS), and Texas Commission on Environmental Quality (TCEQ) requirements.

76. USE OF DHS SEAL, LOGO, AND FLAGS PROHIBITED WITHOUT PRIOR APROVAL

Contractor must obtain permission from the U.S. Department of Homeland Security financial assistance office (DHS FAO) **prior** to using DHS seals(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials, including use of the United States Coast Guard seal, logo, crests or reproductions of flags or likenesses of Coast Guard Officials.

77. FEDERAL GOVERNMENT NOT A PARTY

Contractor acknowledges that the Federal Government is not a party to the contract and is not subject to any obligations or liabilities to Galveston County, contractor, or any other party pertaining to any matter resulting from the contract.

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78. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

In contracts funded through Federal grants, Contractor acknowledges that 31 U.S.C. Chapter 38, Administrative Remedies for False Claims and Statements (31 U.S.C. § 3801, et seq.) and the implementing regulations thereunder, 49 C.F.R. Part 79, apply to Contractors actions pertaining to the contract.

79. ACKNOWLEDGMENT OF GOVERNMENT RECORD

Proposer acknowledges that its submission in this Request for Proposals, including its Proposal, certifications, affidavits, Vendor Forms (i.e., PEID, W-9, CIQ, etc.) constitutes government records under Chapter 37 of the Texas Penal Code.

80. COMPLIANCE WITH GALVESTON COUNTY PURCHASING POLICIES AND PROCEDURES

Proposer acknowledges, by its submission in this request for Proposals, that it shall comply with the Galveston County Purchasing Policies & Procedures Manual approved by Order of the Galveston County Commissioners' Court on March 7, 2018.

81. ENTIRETY OF AGREEMENT AND MODIFICATION

This contract contains the entire agreement between the parties. Any prior agreement, promise, negotiation, or representation not expressly set forth in this contract has no force or effect. Any subsequent modification to this contract must be in writing, signed by both parties.

An official representative, employee, or agent of the County does not have the authority to modify or amend this contract except pursuant to specific authority to do so granted by the Galveston County Commissioners' Court.

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**GENERAL PROVISIONS
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82. NOTICE

All notices or other communications required or permitted under this contract shall be in writing and shall be deemed to have been duly given if delivered personally in hand, transmitted by facsimile, or mailed certified mail, return receipt requested with proper postage affixed and addressed to the appropriate party at the following address or at such other address as may have been previously given in writing to the parties (Proposer shall provide its notice information with its Proposal submission). If mailed, the notice shall be deemed delivered when actually received, or if earlier, on the third day following deposit in a United States Postal Service post office or receptacle, duly certified, return receipt requested, with proper postage affixed. If delivered in person, notice shall be deemed delivered when receipted for by, or actually received by the receiving Party. If transmitted by facsimile, notice shall be deemed delivered when receipt of such transmission is acknowledged.

To the County at:

Hon. Mark Henry,
County Judge of Galveston County
722 Moody (21st Street), Second (2nd) Floor
Galveston, Texas 77550
Fax: (409) 765-2653

With copies to:

Rufus Crowder, CPPO CPPB,
Galveston County Purchasing Agent
722 Moody (21st Street), Fifth (5th) Floor
Galveston, Texas 77550
Fax: (409) 621-7997

To the Contractor at:

End of General Provisions

SPECIAL PROVISIONS

**REQUEST FOR PROPOSALS
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SPECIAL PROVISIONS

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The General Provisions and the Special Provisions of this Request for Proposals and the Exhibits attached hereto are made a part of this agreement between the Parties. In the event of a conflict between the General Provisions and the Special Provisions, the terms of the Special Provisions shall control.

A. PURPOSE

Through this Request for Proposals (“RFP”), Galveston County seeks proposals from qualified building / renovation contractors to assist Galveston County in the renovation of a 21,200 SF existing building located at 1207 Oak Street, La Marque, Texas 77568, that was used as a Community Health Center.

The renovation will convert the building into a social rehabilitation facility that houses 20 beds. The renovation includes architectural, structural, civil, mechanical, electrical, landscaping, plumbing, and fire protection.

Interior demolition, and associated remediation / abatement has been performed, however, remediation / abatement and disposal of asbestos containing materials will be required at the parapet walls. Asbestos reports are attached to this document.

The successful contractor must have qualified personnel who can represent Galveston County in all aspects of construction described herein. **Note that time is of the essence with this project.**

B. EXCEPTIONS

Any exceptions to these solicitation conditions should be listed on a separate sheet of paper, attached to submittal, and submitted with response at the specified date and time of the solicitation opening.

C. PROCUREMENT TIMELINE

A timeline for this RFP and initial process is included below. Galveston County reserves the right to change these dates and will notify Responders of any changes:

Advertise RFP (first date of publication)	Friday January 19, 2024
Advertise RFP (second date of publication)	Friday, January 26, 2024
Non-Mandatory Pre-Proposal Conference/Site Visit	Tuesday, January 30, 2024 at 10:00 AM
Deadline for Questions & Inquiries	Wednesday, January 31, 2024, by 2:00 PM
Submission Deadline / RFP Opening	Thursday, February 8, 2024, at 2:45 PM

Virtual Bid Opening:

Interested parties can attend the 2:45 PM Thursday, February 8, 2024 bid opening virtually.

Join from the meeting link:

<https://galvestoncountytexas.webex.com/galvestoncountytexas/j.php?MTID=m972e273fb0c9d9dce388556c99df0099>

Join by meeting number

Meeting number (access code): 2493 636 6833

Meeting password: B241016 (2241016 from video systems)

Tap to join from a mobile device (attendees only)

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**REQUEST FOR PROPOSALS
GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION
GALVESTON COUNTY, TEXAS**

+1-415-655-0001,,24936366833## US Toll

Join by phone

+1-415-655-0001 US Toll

Global call-in numbers

Join from a video system or application

Dial 24936366833@galvestoncountytexas.webex.com

You can also dial 173.243.2.68 and enter your meeting number.

D. PRE-PROPOSAL CONFERENCE

A pre-proposal conference will be held on Tuesday, January 30, 2024, at 10:00 AM CST at 9850 Emmett F. Lowry Expressway, Texas City, TX 77591. A site visit will be held immediately after, at 1207 Oak St., La Marque, Texas 77568. ATTENDANCE IS STRONGLY ENCOURAGED!

Virtual Pre-Proposal Conference:

Interested parties can attend the Tuesday, January 30, 2024 at 10:00 a.m. pre-proposal conference virtually.

Join using the meeting link below:

Join from the Meeting Link:

<https://galvestoncountytexas.webex.com/galvestoncountytexas/j.php?MTID=m48cd5d5af531d773a592717875a5dc72>

Join by meeting number

Meeting number (access code): 2499 515 1842

Meeting password: B241016 (2241016 from video systems)

Tap to join from a mobile device (attendees only)

+1-415-655-0001,,24995151842## US Toll

Join by phone

+1-415-655-0001 US Toll

Global call-in numbers

Join from a video system or application

Dial 24995151842@galvestoncountytexas.webex.com

You can also dial 173.243.2.68 and enter your meeting number.

E. SUBMISSION INSTRUCTIONS

One (1) unbound single-sided original proposals and three (3) single-sided copies must be submitted no later than 2:45 P.M. CST, on Thursday, February 8, 2024:

**Rufus G. Crowder, CPPO CPPB
Purchasing Agent
County of Galveston
722 Moody Avenue (21st Street), Fifth (5th) Floor
Galveston, TX 77550**

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The time stamp clock located in the Purchasing Agent's office shall serve as the official time keeping piece for this solicitation process. Any bids received after **2:45 P.M. CST** on the specified date will be returned unopened.

Specifications can be obtained at the office of the Galveston County Purchasing Agent, located in the Galveston County Courthouse, 722 Moody, (21st Street), Floor 5, Purchasing, Galveston, Texas 77550, or by visiting the Galveston County website @ <http://www.galvestoncountytexas.gov/county-offices/purchasing>

F. BID SURETY

A surety/ bid bond is a requirement of this solicitation.

G. PERFORMANCE AND PAYMENT BONDS

Performance and Payment Bonds are requirements of this solicitation.

H. BEST AND FINAL OFFERS (BAFO)

The Best and Final Offer process is applicable to this solicitation.

I. DAVIS-BACON WAGE RATES

Davis-Bacon Wage Rates are requirements of this solicitation.

Attention is called to the fact that not less than, the federally determined prevailing (Davis-Bacon and Related Acts) wage rates are required to be paid to laborers and mechanics. When required by Federal program legislation, all prime construction contracts in excess of \$2,000 must include a provision for compliance with the Davis-Bacon Act as supplemented by the Department of Labor regulations (29 C.F.R. Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractor must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. In addition, contractors must be required to pay wages not less than once a week. In addition, the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, or national origin. Please reference the General Provisions, item 69, Procurement Laws, sub-item 3, **Davis-Bacon Act as amended (40 U.S.C. 3141-3148)**.

J. DEBARMENT

To participate in this solicitation, respondent certifies that neither it, nor any of its Principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. All contractors/subcontractors that are debarred, suspended, or otherwise excluded from or ineligible for participation on federal assistance programs may not undertake any activity in part or in full under this project.

K. PERSONNEL TO CONTACT

Responders desiring an explanation or interpretation relative to this solicitation must request it in writing. Oral explanations or instructions will not be binding. Any information given to a Responder, which in the opinion of the County affects all responders or would be prejudicial to other Responders if not communicated, shall be furnished to all Responders as an addendum to the solicitation. Responders **must** direct all inquiries to the following:

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REQUEST FOR PROPOSALS GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION GALVESTON COUNTY, TEXAS

Rufus G. Crowder, CPPO CPPB
Purchasing Agent
722 21st Street (Moody)
Galveston, Texas 77550
e-mail: purchasing.bids@co.galveston.tx.us

Responders must e-mail their requests (with the subject line “**RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction – Questions**”) for additional information and/or clarification to the address listed above. The request must include the Responder’s name and the RFP number and title.

Any request for additional information or clarification must be received in writing no later than 2:00 p.m. on Tuesday, January 30, 2024. Late requests or those not delivered to the proper address may not receive a reply. Responders shall not attempt to contact the County by any other means. The Purchasing Agent’s Office shall post the answers on the County website from the procurement web page and via addendum.

The County will issue responses to inquiries and any other corrections or amendments, it deems necessary, in the form of a written addendum, issued prior to the RFP Submission Deadline / Solicitation Opening date. The County, at its sole discretion, may not issue a response to an RFI submittal. Responders should not rely on any oral or written representations, statements, or explanations, other than those made in this RFP or in any written addendum to this RFP. Where there appears to be conflict between the RFP and any issued addenda, the last addendum issued will prevail.

Addenda will be posted and made available on the County’s procurement web page. **It is the Responder’s sole responsibility to ensure receipt of all addenda prior to submitting its Proposals.** All Responders should check the County’s procurement web page for all addenda prior to submitting a response.

The County’s procurement web page is located at <http://www.galvestoncountytexas.gov/county-offices/purchasing>.

The Responder must acknowledge the receipt of all addenda on the forms provided. In the event a Responder fails to acknowledge receipt of such addenda, the County may, at its sole discretion, determine that such failure to acknowledge any or all addenda does not materially affect the RFP and waive the acknowledgement of one or more addenda.

Responders who submit inquiries *after* the deadline date for receipt of questions indicated on the Procurement Timeline, risk that its response in the procurement will not be responsive or competitive because the County is not able to respond before the RFP receipt date or in sufficient time for the Responder to prepare a responsive or competitive submittal.

All questions and responses as posted on the County website pertaining to this RFP are considered an addendum to, and part of, this RFP. Each Responder shall be responsible for monitoring the County website for new or revised RFP information. The County shall not be bound by any verbal information, nor shall it be bound by any written information that is not either contained within the RFP or formally issued as an addendum by the Purchasing Agent’s Office.

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L. PROGRAM ADMINISTRATION & CONTRACT MANAGEMENT

The Program Administrator/Contract Manager that will manage the work to be performed under the resultant contract for the purpose of this RFP is:

**Jose Escobedo
Galveston County Facilities Director
722 Moody, (21st St.), 6th Floor
Galveston, TX 77550**

The Galveston County Commissioners' Court, and/or authorized designees will be responsible for negotiating with the successful Vendor the scope of work, the standards of performance, the specific technology provided, and the support services required for the proposed projects. All contractual amendments will be processed in accordance with Galveston County Purchasing Policies. Amendments will also be brought to Galveston County Commissioners Court for approval as deemed necessary. The approval process serves to ensure the project technology and/or service is within the scope of the resultant contract, that pricing meets the agreed-upon pricing methodology as specified in the contract, and that funds are available.

M. REQUIREMENTS OF REQUEST FOR PROPOSAL

One (1) unbound single-sided original proposals and three (3) single-sided copies should be concise and include all attachments and work samples. Proposals must be presented on business letterhead. Proposals must be postmarked and received no later than **2:00 p.m. on Thursday, October 26, 2023**. Respondents are advised that all submissions (including those not selected for engagement) may be made available to the public on request upon completion of the process and award of a contract(s). Accordingly, any information included in the proposal that the respondent believes to be proprietary or confidential should be clearly identified as such.

PROPOSALS MUST CONTAIN THE FOLLOWING INFORMATION ON THE FRONT COVER PAGE:

1. **Name of proposer: (FIRM, CORPORATION, BUSINESS, OR INDIVIDUAL)**
2. **Federal I.D. Number**
3. **Primary Local Business Address**
4. **Phone number: (____-____-____), fax number: (____-____-____)**
5. **Present proposer or entity has been in business under its present name since:**
6. **Licensed by the State of Texas as:**
7. **The license number(s) for the performance of these services is/are:**
8. **PROPOSER: By: _____**
9. **(Authorized Signature signed in blue ink)**
10. **(Printed Name of Signer)**
11. **(Title of Signer)**
12. **(Date Signed)**
13. **All copies should be placed in a single envelope or box and marked on the outside:**

**Proposal for Gulf Coast Mental Health Crisis Unit Construction
c/o Rufus G. Crowder, CPPO CPPB
Purchasing Agent
Galveston County
722 Moody (21st Street), Fifth (5th) Floor, Purchasing
Galveston, Texas 77550**

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At the end of your submission, include the following statement:

“I certify that the preceding and referenced information is accurate to the best of my knowledge and belief” and have it signed and dated by the Principal responsible for the submission.

N. INSURANCE

Responder must submit, with its response, a current certificate of insurance evidencing coverage in the amounts specified below or greater. In lieu of submitting a certificate of insurance, Respondents may submit a notarized statement from an insurance company authorized to conduct business in the State of Texas guaranteeing that Respondent has such insurance. Provided however, that successful Respondent(s) shall be required to provide a current certificate of insurance to the Galveston County Purchasing Agent’s Office before Respondent commences any work hereunder. **Insurance shall be placed with insurers having an A.M. Best’s rating of no less than A.** Such insurance must be issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions ensuring the public from loss or damage that may arise to any person or property by reason of services rendered by Contractor. **Galveston County shall be listed as an additional insured on each policy and all certificates of insurance and Contractor shall provide Galveston County with no less than thirty (30) calendar days prior notice of any changes to the policy during the contractual period.**

Certificates of Insurance, fully executed by a licensed representative of the insurance company written or countersigned by an authorized Texas state agency, shall be filed with the County Purchasing Agent within ten (10) calendar days of the execution of this Agreement as written proof of such insurance and further provided that Contractor shall not commence work under this Agreement until Contractor has obtained all insurance required herein, provided written proof as required herein, and received written notice to proceed issued from the County Purchasing Agent. **Failure to provide such evidence of insurance within the ten (10) calendar day period shall constitute an event of default.**

Workers’ Compensation Insurance. Respondent shall carry in full force Workers’ Compensation Insurance Policy(ies), if there is more than one employee, for all its employees, including but not limited to full time, part time, and emergency employees employed by the Contractor.

Commercial General Liability. Respondent shall carry in full force commercial general liability insurance with a limit of not less than \$1,000,000 each occurrence and \$2,000,000 in the aggregate. The Policy shall, minimally, cover liability for bodily injury, personal injury, and property damage.

Business Automobile Liability. Respondent shall carry in full force business automobile liability coverage with a combined bodily injury/property damage limit of not less than \$1,000,000 each accident. The policy shall cover liability arising from the operation of licensed vehicles by policyholder.

Subrogation Waiver. Contractor and Contractor’s insurance carrier shall waive any and all rights to subrogation against Galveston County in regard to any suit or claim arising out of personal injury or property damage resulting from Contractor’s performance under this Agreement.

O. SCOPE OF WORK

Galveston County seeks proposals from qualified building / renovation contractors to assist Galveston County in the renovation of a 21,200 SF existing building located at 1207 Oak Street, La Marque, Texas 77568 (the Property), that was used as a Community Health Center. The renovation will convert the building into a social rehabilitation facility that houses 20 beds. The renovation includes architectural, structural, civil, mechanical, electrical, landscaping, plumbing and fire protection. Interior demolition, and associated remediation / abatement

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has been performed; however, remediation / abatement and disposal of asbestos containing materials will be required at the parapet walls. Asbestos reports are included in this package. Reference Documents can be obtained from the assigned Architect listed below:

Huitt-Zollars, Inc.
1001 Fannin Street, Suite 4040
Houston, TX 77002
Attn: William Trotty
wtrotty@huitt-zollars.com
(713) 622-1180

Time is of the essence in the performance of this Scope of Work: renovations must be completed by Friday, November 1, 2024. The successful respondent shall be referred to herein as the "Contractor."

P. CONTRACT

The Request for Proposals to which this Scope of Work is attached, and of which this Scope of Work is a material part, together with Contractor's proposal, shall form the basis of a service contract to be entered by the parties.

Q. QUALITY ASSURANCE

Contractor shall comply with all applicable EPA, state and local notification regulations before starting work. Contractor shall comply with hauling and disposal regulations of authorities having jurisdiction; all other codes, standards, regulations, and workers' safety rules that are administered by federal agencies (EPA, OSHA, and TxDOT) or state agencies (State OSHA, etc.); and any other local regulations and standards (i.e. building codes) that may apply for demolition work required. The contractor must secure all local permits. By submitting a proposal, Contractor affirms that they have familiarized themselves with the legal requirements (federal, state, and local laws, ordinances, rules, and regulations) and other conditions which may affect performance of this Scope of Work.

R. PROJECT CONDITIONS

The building is vacant and interior demolition has been performed. Galveston County shall make its best efforts to maintain the site conditions existing at the time of inspection for bidding purposes. Contractor must comply with any/all required permits required by local authorities and ordinances. Contractor will not be permitted to store any removed items or materials on-site.

S. EXAMINATION

Contractor must survey existing site conditions and make an independent determination as to the extent of demolition required and the existence of any hazardous materials or conditions. Contractor must survey the condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition. Contractor must perform regular site examinations as the work progresses and notify Owner of any hazardous conditions.

T. PREPARATION

Contractor must secure all necessary permits to cut and/or cap all utilities including water, gas, electricity, and sewer; contact Dig Safe (Texas law requires you to contact 811 two-business days {excluding weekends and holidays} before you dig) and coordinate identification of all underground utilities; and consult with electrical to coordinate the protection of power lines adjacent to the building. Contractor must make all preparations to secure

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and protect the following components, which shall survive all demolition work and remain on the Property: (1) the existing trees located around the Property; (2) Contractor must drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations. Contractor must employ a certified, licensed exterminator to treat the building and to control rodents and vermin before and during demolition operations. Contractor shall not obstruct streets, walks, or other adjacent occupied or used facilities without permission from Galveston County and authorities having jurisdiction. Contractor shall provide alternate routes around closed or obstructed traffic ways if required by governing regulations. Furthermore, if required, Contractor shall arrange for police detail as required during demolition activities. Contractor must erect temporary protection such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

U. EXPLOSIVES

The use of explosives will not be permitted.

V. POLLUTION CONTROLS

Under the authority of Section 112 of the Clean Air Act, as amended, 42 U.S.C. 1857 (C-7) (the “Clean Air Act”), the U.S. Environmental Protection Agency (“EPA”) promulgated National Emission Standards for Hazardous Air Pollutants. See 38 F.R. 8820. Asbestos was designated a hazardous air pollutant, and standards were set for its use and to control asbestos emissions. It was determined that one significant source of asbestos emissions was the demolition of certain buildings and structures. In keeping with the Clean Air Act, Contractor shall cooperate with EPA personnel and allow EPA personnel to freely enter the demolition site, review any records, inspect any demolition method, and sample or observe any omissions. All demolition operations conducted by Contractor are to be in compliance with applicable provisions of Section 112 of the Clean Air Act and 40 C.F.R. Part 61. By responding to this RFP Contractor acknowledges that Sections 113(c)(1) and (2) of the Clean Air Act carry penalties and fines for non-compliance. Contractor must use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Contractor must comply with all applicable environmental protection regulations, including DEM Regulation #5 – Fugitive Dust. Contractor must not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water. Contractor must remove and transport debris only in a manner that will prevent spillage on adjacent surfaces and areas. Contractor must clean adjacent buildings and improvements of dust, dirt and debris caused by demolition operations, and return adjacent areas to the conditions existing before the start of demolition. Contractor shall limit hours of operation, including staging and set up, to Monday through Friday during the hours of 8:00 a.m. to 6:00 p.m. Special hours of operation outside the normal hours must be approved in advance by Galveston County. Contractor shall limit noise pollution at all times to prevent objectionable conditions.

W. DEMOLITION

Demolition: Subject to the exceptions listed above, Contractor shall demolish all elements noted on the plans and other debris (including brush) that comprise the Property, and completely remove same from the site. Contractor shall perform demolition operations in accordance with all applicable laws and regulations and the following general policies:

- Ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
- Dispose of demolished items and materials promptly. On-site storage of removed items is prohibited.
- Remove air-conditioning equipment without releasing refrigerants.

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- Special Conditions: The Contractor shall preserve all surrounding buildings and property. Contractor should note the proximity of surrounding buildings. Any damage to surrounding buildings or property will be promptly repaired by the Contractor at its sole expense.

X. DISPOSAL OF DEMOLISHED MATERIALS

General: Contractor must promptly and properly dispose of demolished materials. Contractor may not allow demolished materials to accumulate on-site and may not burn demolished materials. Landfill Disposal: Contractor shall transport all demolished materials off-site and legally dispose of them. Contractor must supply Galveston County with copies of all landfill and disposal receipts.

Y. PAYMENT

Payment for services will be negotiated with the successful respondent pursuant to the RFP process. Galveston County will maintain a 10% retainage to be released 30 days after completion. Final payment shall not be released until Contractor has completed all punch list items, all inspections have been completed and contractor has fulfilled all obligations set forth herein and in the contract.

Z. NEWFORMA

Contractor will be required to use the PMI system, provided by the architect, for maintaining all project documents.

AA. COORDINATION OF OWNER'S EQUIPMENT

Contract will be responsible for coordinating with the Owner for the installation of Owner supplied equipment.

BB. ITEMS TO BE INCLUDED WITH YOUR PROPOSAL

a. General Firm Information

- Provide a brief description of your firm, including but not limited to the following:
 - Name of the principal(s) of the firm
 - Name, telephone number and email address of a representative of the firm authorized to discuss your proposal.
 - Address of all offices of the firm.
 - Number of Partners, Associates, Contracted personnel, and support staff proposed for this project.

b. Experience and Resources

- Identify the Principal, Partners, Associates and Contracted Personnel that would be involved in providing services to Galveston County. Provide appropriate background information and identify what their responsibilities would be in serving Galveston County. Describe your firm and its capabilities. In particular, support your capacity to perform the Scope of Work.
- Years of experience and detailed qualifications in performing the range of demolition services on various property types in compliance with NESHAP standards, including team's resumes. Past projects will be reviewed to determine if the respondent has successfully completed projects similar in nature and scope. Respondents should provide narrative examples of three (3) projects that are similar in nature to projects described in the RFP.

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- iii. If you engage independent contractors, how many do you intend to hire? Do you intend to cover them with workers compensation? (All independent contractors will be required to have worker's compensation coverage, which will be the responsibility of the respondent)
 - iv. Capacity to complete the interior renovation of the facility within a short period of time.
 - v. Plan for recycling or waste management of used construction materials in a timely manner.
 - vi. Identify any material litigation, administrative proceedings, or investigations in which your firm is currently involved. Identify any material litigation, administrative proceedings, or investigations, to which your firm or any of its principals, partners, associates, subcontractors, or support staff was a party, that has been settled within the past two (2) years.
- c. Cost and Delivery Date
- i. Please provide a pricing proposal that includes the mobilization (base) charge, the cost for the interior renovation of the facility and services to successfully abate and dispose of asbestos containing materials, including all labor, materials, products, permits, licenses, authorizations, inspections, disposal fees and all other fees and expenses necessary to complete the work. The Contractor will sign a fixed price contract for all work and services.
 - ii. Time is of the essence. Demolition must be completed no later than **Friday, November 1, 2024.**
- d. Miscellaneous
- i. Galveston County encourages the participation of persons of color, women, persons with disabilities and members of other federally and State-protected classes. Describe your firm's affirmative action program and activities. Include the number and percentage of members of federally and State-protected classes who are either principals or senior managers in your firm, the number and percentage of members of federally and State-protected classes in your firm who will work on Galveston County's engagement and, if applicable, a copy of your Minority- or Women-Owned Business Enterprise state certification.
 - ii. Discuss any topics not covered in this Request for Proposals that you would like to bring to Galveston County's attention.
 - iii. Please include a letter from your president, chairman or CEO certifying that (i) no member of your firm has made inquiries or contacts with respect to this Request for Proposals other than in an email or written communication to **Rufus Crowder, Purchasing Agent, Galveston County, 722 Moody (21st Street) Fifth (5th) Floor, Galveston, Texas 77550** seeking clarification on the Scope of Work set forth in this proposal, from the date of this RFP through the date of your proposal, (ii) no member of your firm will make any such inquiry or contact until after October 26, 2023, (iii) all information in your proposal is true and correct to the best of her/his knowledge, (iv) no member of your firm gave anything of monetary value or promise of future employment to a Galveston County employee or Commissioner, or a relative of the same, based on any understanding that such person's action or judgment will be influenced and (v) your firm is in full compliance with Texas Ethics Commission, Galveston County General Laws, Reporting of Political Contributions by State Vendors.

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CC. ALTERNATE PROPOSALS

Firms submitting alternate proposals to the Scope of Work set forth in this RFP, must submit them on separate sheet(s) of paper and include with original submittal. Although, the County is seeking proposals as specified in this RFP, reasonable alternatives may be considered.

DD. INVOICES:

Invoices must be itemized indicating all materials and supplies used. Invoices must be submitted to:

**Galveston County Auditor's Office
Attn: Accounts Payable
P.O. Box 1418
Galveston, Texas 77553**

Failure to submit invoices to the above address or failure to include the Purchase Order Number will result in delay in payment.

Vendor must accept purchase order numbers for specified supplies, equipment, and/or services. Vendor shall not perform any work or release any supplies and/or equipment to any authorized representative of the County of Galveston unless a valid purchase order number issued by the office of the Galveston County Purchasing Agent accompanies the order or if vendor can comply with the provision as stated in the General Provisions, page 3, item 11, Procurement Card Program.

Payment for any items issued without prior receipt of a valid purchase order number may become the sole responsibility of the successful vendor.

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EE. EVALUATION AND SELECTION PROCESS

An evaluation committee shall review and evaluate the Proposals timely submitted to the County Purchasing Agent in this request for qualifications. Proposals shall be reviewed by the evaluation committee and shall be evaluated in accordance with the evaluation criteria listed herein. The evaluation committee will determine which teams are qualified based on demonstrated competence and qualifications. The evaluation committee shall evaluate and score each response. The points from each scoring category will be comprised from the following:

- **Category 1—35 points:**
Professional capacity to undertake the Scope of Work.
- **Category 2—30 points:**
As time is of the essence, ability to complete the project by Friday, November 1, 2024.
- **Category 3—15 points:**
Proposed cost.
- **Category 4—15 points:**
Previous work experience and performance with Galveston County and/or similar organizations.
- **Category 5—5 points:**
Thorough knowledge of on-site conditions and scope of work.

It is important that all information requested in the RFP is included in your submission. Omission of any information may cause the submission to be declined as non-responsive. By this Request for Proposals, Galveston County has not committed itself to undertake the work set forth. Galveston County reserves the right to reject any and all proposals, to rebid the original or amended scope of services and to enter into negotiations with one or more respondents. Galveston County reserves the right to make those decisions after receipt of responses. Galveston County's decision on these matters is final. The final scope of services will be negotiated and modified as site conditions warrant. Ongoing deliverables and modifications to the work scope will be made by Galveston County staff reporting to our executive team. By the submission of its Proposals (also called response) in this request for proposals, the Respondent accepts the requirements, formatting, and evaluation process referenced herein.

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 GALVESTON COUNTY, TEXAS**

FF.REQUIRED DOCUMENTS CHECKLIST

By signing here, the firm does hereby attest that it has fully read the instructions, conditions, and general and special provisions and understands them. **Proposer shall return this checklist with completed submittal.**

THE COMPANY OF: _____

ADDRESS: _____

The following documents shall be returned or confirmed with an "X" with solicitation submittals. Failure to do so may be ample cause for rejection of submittal and deemed as non-responsive. It is the responsibility of the Bidder to ensure that Bidder has received all addenda.

Items:	Confirmed (X):
1. Required Documents Checklist (this page)	_____
2. Addenda Acknowledgement (if any)	#1_____ #2_____ #3_____ #4_____
3. One (1) original, three (3) copies of submittal	_____
4. ATTACHMENT A - Vendor Qualification Packet	_____
5. ATTACHMENT B - Certification Reg. Debarment, Suspension, and Other Ineligibility	_____
6. ATTACHMENT C - Certification Regarding Lobbying Form	_____
7. ATTACHMENT D - Non-Collusion Affidavit	_____
8. ATTACHMENT E - Prohibition on Contracts with Companies Boycotting Israel	_____
9. ATTACHMENT F - Prohibition on Contracts with Certain Companies	_____
8. ATTACHMENT G - Information for Notice	_____
10. ATTACHMENT H - References	_____
14. Bid Bond	_____
15. Three (3) signed contracts – Included	_____
16. Proposal Submittal Form	_____
17. Consent of Surety to Reduction in our Partial Release of Retainage	_____
18. Contractor's Affidavit of Release of Lien	_____
19. Contractor's Affidavit of Payment of Debt and Claims	_____
20. Consent of Surety Company to Final Payment	_____
21. Contract Award	_____
22. Special Provisions for Construction	_____

SPECIAL PROVISIONS

**REQUEST FOR PROPOSALS
GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION
GALVESTON COUNTY, TEXAS**

Person to contact regarding this qualification: _____

Title: _____ Phone: _____ Fax: _____

E-mail address: _____

Name of person authorized to bid the Firm: _____

Signature: _____ Date: _____

Title: _____ Phone: _____ Fax: _____

E-mail address: _____

SPECIAL PROVISIONS

**REQUEST FOR PROPOSALS
GULF COAST MENTAL HEALTH CRISIS UNIT CONSTRUCTION
GALVESTON COUNTY, TEXAS**

GG. PROPOSAL SUBMITTAL FORM

Project Location: 1207 Oak Street, La Marque, Texas 77568

The undersigned TEXAS LICENSED CONTRACTOR, having examined these documents, and having full knowledge of the condition under which the work described herein must be performed, hereby proposes that she/he will fulfill the obligations contained herein in accordance with all instructions, terms, conditions, and specifications set forth; and that she/he will furnish all required products/services and pay all incidental costs in strict conformity with these documents for the stated prices as payment in full.

Base Proposal: For all work required by the Proposal Documents (including any and all unit prices designated "Base Bid" but not alternates) the sum of:

_____ Dollars (\$ _____)

Allowances:

City (permitting changes)	\$ 50,000.00
Health/food establishment Changes	\$ 50,000.00
Structural Changes	\$ <u>50,000.00</u>

Total Proposal Amount (including Allowances):

_____ Dollars (\$ _____)

Alternate No.1: Full removal and replacement of the roof deck

_____ Dollars (\$ _____)

Submitting Firm: _____

Address: _____

Name of Authorized Representative (print/type): _____

Title: _____

Authorized Signature: _____



County of Galveston Purchasing Department Vendor Qualification Packet - Attachment A

(rev. 1.4, September 28, 2017)

All interested parties seeking consideration for qualified vendor status with the County of Galveston should complete and return only the following forms to:

Galveston County Purchasing Department
722 Moody Avenue, (21st Street), 5th Floor
Galveston, Texas 77550
(409) 770-5371 office
(409) 621-7987 fax

PEID Form: Person /Entity Information Data

W -9 Form: Request for Taxpayer Identification Number and Certification
(please note that the included form may not be the latest revised form issued by the Internal Revenue Service. Please check the IRS website at <http://www.irs.gov/pub/irs-rd/ffv9.pdf> for the latest revision of this form.)

CIQ Form: Conflict of Interest Questionnaire

(please note that the included form may not be the latest revised form issued by the State of Texas Ethics Commission. Please check the Texas Ethics Commission website at http://www.ethics.state.tx.us/whatsnew/conflict_forms.htm for the latest revision of this form. Please note that Galveston County Purchasing Agent is not responsible for the filing of this form with the Galveston County Clerk per instructions of the State of Texas Ethics Commission).

Debarment: **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS & REQUIREMENT TO REGISTER IN SAM**

*Vendors/contractor certifies that neither it, nor any of its Principals, are presently debarred, suspended, proposed for debarment, disqualified, excluded, or in any way declared ineligible for the award of contracts by any Federal agency. Vendor agrees that it shall refund Galveston County for any payments made to Contractor while ineligible. Vendor acknowledges that Contractor's uncured failure to perform under any agreement with the County of Galveston, if such should occur, may result in Contractor being debarred from performing additional work for the County, the respecting State Agency administering the grant funding the contract, if applicable, the State, FEMA or HUD (as applicable), and other Federal and State entities. Further, Vendor has executed the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters and returned the fully completed and executed original certification with the submission of this Vendor Qualification Packet. **The truthful and fully completed and executed original of the Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters must be included with the submission of this Vendor Qualification Packet and is a mandatory requirement to become a vendor of Galveston County. Vendor's failure to include the fully completed and executed original of this Certification shall be considered non-compliant with the requirements of this vendor qualification request and grounds for the rejection of vendor's request. Vendor shall immediately notify the County Purchasing Agent if it becomes debarred or suspended, placed on***

the Consolidated List of Debarred Contractors, or in any other way becomes ineligible for award of contract by any Federal agency. This Certification is a material fact relied upon by Galveston County; if it is later determined that the vendor did not comply with 2 C. F. R. Part 180 and 2 C.F.R. Part 3000, in addition to the remedies available to Galveston County and the State agency administering a grant, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment of contractor. If the contract to be awarded pursuant to a Galveston County procurement effort involves the use of Federal funds, then vendor must also be registered in the Federal Contractor Registry through the System for Award Management (SAM) to be eligible for award of contract pursuant to the procurement.

Information regarding the SAM is available at:

<http://federalcontractorregistry.com/?gclid=CIGlhf2rr8wCFYkCaQoducANZw> or at <http://sam.gov/portal/SAM/#1>.

No contract involving the use of Federal funds may be awarded to any vendor unless and until such registration is current and in good standing under SAM Successful vendors must maintain SAM registration throughout the entire term of any contractual agreement with the County. If a contract involves the use of Federal funds, then vendor must enclose proof of such SAM registration within its response, which is also a mandatory requirement of County procurement policy; failure to enclose such proof shall be considered non-compliant with the requirements of any procurement effort and grounds for the rejection of vendor's response to any procurement efforts (i.e., bid, proposal, or qualifications statement, as applicable).

Direct Deposit: Direct Deposit Authorization Form – Temporarily suspended until further notice

Certificate(s) of Insurance: If the person or entity seeking qualified vendor status with the County will be performing work at or on any County owned facility and/or property, Certificate(s) of Insurance are required to be submitted prior to performing any work.

Insurance requirements are as follows:

Public Liability and Property Damage Insurance:

Successful vendor agrees to keep in full force and effect, a policy of public liability and property damage insurance issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions insuring the public from any loss or damage that may arise to any person or property by reason of services rendered by vendor. Vendor shall at its own expense be required to carry the following minimum insurance coverages:

1. For damages arising out of bodily injury to or death of one person in anyone occurrence - one hundred thousand and no/100 dollars (\$100,000.00);
2. For damages arising out of bodily injury to or death of two or more persons in anyone occurrence - three hundred thousand and no/100 dollars (\$300,000.00); and
3. For injury to or destruction of property in anyone occurrence - one hundred thousand and no/100 dollars (\$100,000.00).

This insurance shall be either on an occurrence basis or on a claims made basis. Provided however, that if the coverage is on a claims made basis, then the vendor shall be required to purchase, at the termination of this agreement, tail coverage for the County for the period of the County's relationship with the vendor under this agreement. Such coverage shall be in the amounts set forth in subparagraphs (1), (2), and (3) above.

Worker's Compensation Insurance:

Successful vendor shall also carry in full force Workers' Compensation Insurance policy(ies), if there is more than one employee, for all employees, including but not limited to full time, part time, and emergency employees employed by the vendor. Current insurance certificates certifying that such policies as specified above are in full force and effect shall be furnished by the vendor to the County.

The County of Galveston shall be named as additional insured on policies listed in subparagraphs above and shall be notified of any changes to the policy(ies) during the contractual period.

Insurance is to be placed with insurers having a Best rating of no less than A. The vendor shall furnish the County with certificates of insurance and original endorsements affecting coverage required by these insurance clauses. The certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf. The vendor shall be required to submit annual renewals for the term of any contractual agreement, purchase order or term contract, with Galveston County prior to expiration of any policy.

In addition to the remedies stated herein, the County has the right to pursue other remedies permitted by law or in equity.

The County agrees to provide vendor with reasonable and timely notice of any claim, demand, or cause of action made or brought against the County arising out of or related to utilization of the property. Vendor shall have the right to defend any such claim, demand, or cause of action at its sole cost and expense and within its sole and exclusive discretion. The County agrees not to compromise or settle any claim or cause of action arising out of or related to the utilization of the property without the prior written consent of the vendor.

In no event shall the County be liable for any damage to or destruction of any property belonging to the vendor unless specified in writing and agreed upon by both parties.

Procurement Policy - Special Note:

Understand that it is, according to Texas Local Government Code, Section 262.011, Purchasing Agents, subsections (d), (e), and (0), the sole responsibility of the Purchasing Agent to supervise all procurement transactions.

Therefore, be advised that all procurement transactions require proper authorization in the form of a Galveston County purchase order from the Purchasing Agent's office prior to commitment to deliver supplies, materials, equipment, including contracts for repair, service, and maintenance agreements. Any commitments made without proper authorization from the Purchasing Agent's office, pending Commissioners' Court approval, may become the sole responsibility of the individual making the commitment including the obligation of payment.

Code of Ethics - Statement of Purchasing Policy:

Public employment is a public trust. It is the policy of Galveston County to promote and balance the objective of protecting the County's integrity and the objective of facilitating the recruitment and retention of personnel needed by Galveston County. Such policy is implemented by prescribing essential standards of ethical conduct without creating unnecessary obstacles to entering public office.

Public employees must discharge their duties impartially so as to assure fair competitive access to governmental procurement by responsible contractors. Moreover, they should conduct themselves in such a manner as to foster public confidence in the integrity of the Galveston County procurement organization.

To achieve the purpose of these instructions, it is essential that those doing business with Galveston County also observe the ethical standards prescribed here.

General Ethical Standards: It shall be a breach of ethics to attempt to realize personal gain through public employment with Galveston County by any conduct inconsistent with the proper discharge of the employee's duties.

It shall be a breach of ethics to attempt to influence any public employee of Galveston County to breach the standards of ethical conduct set forth in this code.

It shall be a breach of ethics for any employee of Galveston County to participate directly or indirectly in procurement when the employee knows that:

- The employee or any member of the employee's immediate family has a financial interest pertaining to the procurement.
- A business or organization in which the employee, or any member of the employee's immediate family, has a financial interest pertaining to the procurement.
- Any other person, business or organization with which the employee or any member of the employee's immediate family is negotiating or has an arrangement concerning prospective employment is involved in the procurement.

Gratuities: It shall be a breach of ethics to offer, give or agree to give any employee of Galveston County, or for any employee or former employee of Galveston County to solicit, demand, accept or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation of any part of a program requirement or purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any program requirement or a contract or subcontract, or to any solicitation or proposal therefore pending before this government.

Kickbacks: It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for Galveston County, or any person associated therewith, as an inducement for the award of a subcontract or order.

Contract Clause: The prohibition against gratuities and kickbacks prescribed above shall be conspicuously set forth in every contract and solicitation by Galveston County.

Confidential Information: It shall be a breach of ethics for any employee or former employee of Galveston County to knowingly use confidential information for actual or anticipated personal gain, or for the actual or anticipated gain of any person.

Questions/Concerns:

If you have any questions or concerns regarding the information or instructions contained within this packet, please contact any member of the Purchasing Department staff at **(409) 770-5371**.

CONFLICT OF INTEREST DISCLOSURE REPORTING

Proposer may be required under Chapter 176 of the Texas Local Government Code to complete and file a conflict of interest questionnaire (CIQ Form). If so, the completed CIQ Form must be filed with the County Clerk of Galveston County, Texas.

If Proposer has an employment or other business relationship with an officer of Galveston County or with a family member of an officer of Galveston County that results in the officer or family member of the officer receiving taxable income that exceeds \$2,500.00 during the preceding 12 -month period, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County.

If Proposer has given an officer of Galveston County or a family member of an officer of Galveston County one or more gifts with an aggregate value of more than \$250.00 during the preceding 12-months, then Proposer **MUST** complete a CIQ Form and file the original of the CIQ Form with the County Clerk of Galveston County

The Galveston County Clerk has offices at the following locations:

Galveston County Clerk
Galveston County Justice Center, Suite 2001
600 59th Street
Galveston, Texas 77551

Galveston County Clerk
North County Annex, 1st Floor
174 Calder Road
League City, Texas 77573

Again, if Proposer is required to file a CIQ Form, the original completed form is filed with the Galveston County Clerk (not the Purchasing Agent).

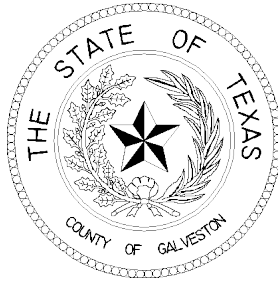
For Proposer's convenience, a blank CIQ Form is enclosed with this proposal. Blank CIQ Forms may also be obtained by visiting the Galveston County Clerk's website and/or the Purchasing Agent's website - both of these web sites are linked to the Galveston County homepage at <http://www.galvestoncountytexas.gov>

As well, blank CIQ Forms may be obtained by visiting the Texas Ethics Commission website, specifically at <http://www.ethics.state.tx.us/whatsnew/conflictfroms.htm>

Chapter 176 specifies deadlines for the filing of CIQ Forms (both initial filings and updated filings).

It is Proposer's sole responsibility to file a true and complete CIQ Form with the Galveston County Clerk if Proposer is required to file by the requirements of Chapter 176. Proposer is advised that it is an offense to fail to comply with the disclosure reporting requirements dictated under Chapter 176 of the Texas Local Government Code.

If you have questions about compliance with Chapter 176, please consult your own legal counsel. Compliance is the individual responsibility of each person, business, and agent who is subject to Chapter 176 of the Texas Local Government Code.



COUNTY of GALVESTON
Purchasing Department

rev. 1.3, March 29, 2010

FORM PEID:	Request for Person-Entity Identification Data
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Instructions: Please type or print clearly when completing sections 1 thru 4 and return completed form to:

Galveston County Purchasing Agent
722 Moody Avenue (21 st. Street), 5th Floor
Galveston, Texas 77550
(409) 770-5371
prodoc@co.galveston.tx.us

1.	Business Name:			
	Attention Line:			
2.	Physical Address:			
	City:		State:	Zip+4:
3.	Billing / Remit Address:			
	City:		State:	Zip+4
4.	Main Contact Person:			
	Main Phone Number:			
	Fax Number:			
	E-mail Address:			

Areas below are for County use only.

Requested By:	Phone / Ext. #
Department:	Date:

Action Requested - Check One:	IFAS PEID Vendor Number:	
<input type="checkbox"/> Add New	<input type="checkbox"/> Change Data	<input type="checkbox"/> Re-activate
<input type="checkbox"/> Inactivate	<input type="checkbox"/> Employee	<input type="checkbox"/> Attorney
<input type="checkbox"/> Landlord	<input type="checkbox"/> Foster Parent	<input type="checkbox"/> Refund
<input type="checkbox"/> OneTime	<input type="checkbox"/> Foster Child	

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting*, later, for further information.

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

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

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

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

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

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

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

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

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

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

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

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

Backup Withholding

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

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

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the instructions for Part II for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

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

Also see *Special rules for partnerships*, earlier.

What is FATCA Reporting?

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

Updating Your Information

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

Penalties

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

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

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

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

Specific Instructions

Line 1

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

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

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

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

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

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

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

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

Line 2

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

Line 3

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

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

Line 4, Exemptions

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

Exempt payee code.

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

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

- 1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)
- 2—The United States or any of its agencies or instrumentalities
- 3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities
- 4—A foreign government or any of its political subdivisions, agencies, or instrumentalities
- 5—A corporation
- 6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession
- 7—A futures commission merchant registered with the Commodity Futures Trading Commission
- 8—A real estate investment trust
- 9—An entity registered at all times during the tax year under the Investment Company Act of 1940
- 10—A common trust fund operated by a bank under section 584(a)
- 11—A financial institution
- 12—A middleman known in the investment community as a nominee or custodian
- 13—A trust exempt from tax under section 664 or described in section 4947

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

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

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

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

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

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

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

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

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

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

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

G—A real estate investment trust

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

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

A bank as defined in section 581

K—A broker

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

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

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

Line 5

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

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

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

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

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

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

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

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

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

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

Part II. Certification

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

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

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

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983.

You must give your correct TIN, but you do not have to sign the certification.

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

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

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

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

What Name and Number To Give the Requester

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

For this type of account:	Give name and EIN of:
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

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

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

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

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

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

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

Secure Your Tax Records From Identity Theft

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

To reduce your risk:

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

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

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

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

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

Protect yourself from suspicious emails or phishing schemes.

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

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

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

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

Privacy Act Notice

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

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor or other person doing business with local governmental entity

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

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

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

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

OFFICE USE ONLY

Date Received

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

2 Check this box if you are filing an update to a previously filed questionnaire.

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

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

Name of Officer

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

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

Yes NO

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

Yes NO

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

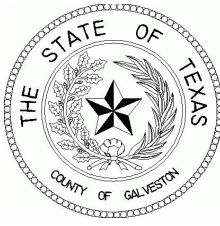
Yes NO

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

4

Signature of person doing business with the governmental entity

Date



ATTACHMENT B
County of Galveston
ACKNOWLEDGMENT AND CERTIFICATION REGARDING DEBARMENT,
SUSPENSION, AND OTHER INELGIBILITY
Executive Orders 12549 & 12689 Certification, Debarment and Suspension

Solicitation Number: RFP #B241016

Solicitation Title: Gulf Coast Mental Health Crisis Unit Construction

Contractor hereby CERTIFIES that:

Contractor, and all of its principals, is not presently debarred, suspended, proposed for debarment, proposed for suspension, or declared ineligible under Executive Order 12549 or Executive Order 12689, Debarment and Suspension, and is not in any other way ineligible for participation in Federal or State assistance programs;

Contractor, and all of its principals, were not and have not been debarred, suspended, proposed for debarment, proposed for suspension, or declared ineligible under Executive Order 12549 or Executive Order 12689, Debarment and Suspension, and were not and have not been in any other way ineligible for participation in Federal or State assistance programs at the time its' proposal was submitted in the procurement identified herein and at any time since submission of its' proposal;

Contractor has included, and shall continue to include, this certification in all contracts between itself and any sub-contractors in connection with services performed under this contract; **and**

Contractor shall notify Galveston County in writing immediately, through written notification to the Galveston County Purchasing Agent, if Contractor is not in compliance with Executive Order 12549 or 12689 during the term of its contract with Galveston County.

Contractor **Represents** and **Warrants** that the individual executing this Acknowledgment and Certification on its behalf has the full power and authority to do so and can legally bind the Contractor hereto.

Name of Business

Date

By: _____
Signature

Printed Name & Title

ATTACHMENT C

CERTIFICATION REGARDING LOBBYING

(31 U.S.C.A. § 1352)

This Certification must be completed, signed, dated and returned to the Galveston County Purchasing Agent

Procurement Number and Description:

RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction

Proposer **CERTIFIES**, to the best of its knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the proposer, to any person for influencing or attempting to influence an officer or employee of an 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 any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the proposer shall complete and submit **Standard Form LLL**, "Disclosure Form to Report Lobbying", in accordance with its instructions.
3. Proposer shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Name of Organization/Corporation: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Signature of Authorized Signatory for Proposer: _____ Date Signed: _____

Title of Authorized Signatory of Proposer: _____

ATTACHMENT D

State of Texas

§

§

County of Galveston

§

NON-COLLUSION AFFIDAVIT

Before me, the undersigned notary, on this day personally appeared _____ (Affiant), whom being first duly sworn, deposes and certifies that:

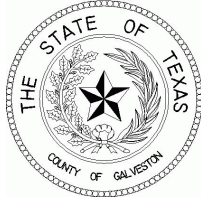
- Affiant is the _____ of _____, that
(Individual, Partner, Corporate Officer) (Name of Qualifier)
submitted the attached Qualification in **RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction**
- Affiant is a duly authorized representative of Qualifier and is authorized to make this Non-Collusion Affidavit;
- The attached Qualification is genuine and is not a collusive or sham Qualification;
- The attached Qualification has been independently arrived at without collusion with any other qualifier, bidder, proposer, person, firm, competitor, or potential competitor;
- Qualifier has not colluded, conspired, connived or agreed, directly or indirectly, with any other qualifier, bidder, proposer, person, firm, competitor, or potential competitor, to submit a collusive or sham qualification or that such other qualifier, bidder, proposer, person, firm, competitor, or potential competitor shall refrain from qualifying;
- Qualifier has not in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other qualifier, bidder, proposer, person, firm, competitor, or potential competitor to fix the price or prices in the attached Qualification or of the qualification any other qualifier;
- Qualifier has not in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other qualifier bidder, proposer, person, firm, competitor, or potential competitor to fix the overhead, profit or cost element of the Qualification price or prices of any other qualifier, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against Galveston County or any person interested in the proposed contract;
- Affiant has not in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other qualifier, bidder, proposer, person, firm, competitor, or potential competitor, paid or agreed to pay any other qualifier, bidder, proposer, person, firm, competitor, or potential competitor any money or anything of value in return for assistance in procuring or attempting to procure a contract or in return for establishing the price or prices in the attached Qualification or the qualification of any other Qualifier; and
- Affiant certifies that Affiant is fully informed regarding the accuracy of the statements contained herein, and under penalties of perjury, certifies and affirms the truth of the statements herein, such penalties being applicable to the Qualifier as well as to Affiant signing on its behalf.

Signature of Affiant

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

Notary Public

My Commission Expires: _____



ATTACHMENT E

Prohibition on Contracts with Companies Boycotting Israel

Prohibition on contracts with companies boycotting Israel per Government Code 2271.001 Definitions:

- (1) **"Boycott Israel"** has the meaning assigned by Section 808.001.
- (2) **"Company"** has the meaning assigned by Section 808.001; except that the term does not include a sole proprietorship.
- (2) **"Governmental entity"** has the meaning assigned by Government Code, Section 2251.001.

PROVISION REQUIRED IN CONTRACT. (a) This section applies only to a contract that:

- (1) is between a governmental entity and a company with 10 or more full-time employees; and
- (2) has a value of \$100,000 or more that is to be paid wholly or partly from public funds of the governmental entity.

(b) A governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it:

- (1) does not boycott Israel; and
- (2) will not boycott Israel during the term of the contract.

As required by GOVERNMENT CODE, CHAPTER 2271, CONTRACTOR hereby verifies that it does not boycott Israel and will not boycott Israel throughout the term of this Agreement. For the purposes of this verification, "Boycott Israel" means refusing to deal with, terminating business activities, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

Individual by oath swears that the following statements are factual and true:

1. Individual is authorized by the Contractor to make this statement for the Contractor.
2. Individual has read and is fully aware of the facts stated in this statement.
3. Individual can read and comprehend the English language.
4. In accordance with Texas Government Code Section 2271.002, this company does not boycott Israel and will not boycott Israel during the term of this contract/agreement.

Date: _____

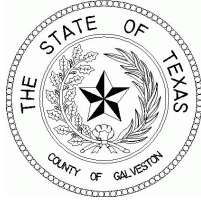
Business Name of Contractor: _____

Company Address: _____

County of Contractor: _____

Individual: _____

Signature of Individual: _____



ATTACHMENT F

Prohibition on Contracts with Certain Companies

Prohibition on contracts with certain companies per Government Code 2252.151 Definitions:

- (1) "Company" has the meaning assigned by Section 806.001.
- (2) "Foreign terrorist organization" means an organization designated as a foreign terrorist organization by the United States secretary of state as authorized by 8 U.S.C. Section 1189.
- (3) "Governmental contract" means a contract awarded by a governmental entity for general construction, an improvement, a service, or a public works project for a purchase of supplies, materials, or equipment. The term includes a contract to obtain a professional or consulting service subject to Government Code, Chapter 2254.
- (4) "Governmental entity" has the meaning assigned by Government Code, Section 2252.001.

Section 2252.152 – CONTRACTS WITH COMPANIES ENGAGED IN BUSINESS WITH IRAN, SUDAN, OR FOREIGN TERRORIST ORGANIZATION PROHIBITED. A governmental entity may not enter into a governmental contract with a company that is identified on a list prepared and maintained under Section 806.051, 807.051, or 2252.153.

Section 2252.153 – Listed Companies. The comptroller shall prepare and maintain, and make available to each governmental entity, a list of companies known to have contracts with or provide supplies or services to a foreign terrorist organization.

Pursuant to Chapter 2252, Texas Government Code, VENDOR represents and certifies that, at the time of execution of this Agreement, neither Vendor, nor any wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of the same (i) engages in business with Iran, Sudan, or any foreign terrorist organization as described in Chapters 806 or 807 of the Texas Government Code, or Subchapter F of Chapter 2252 of the Texas Government Code, or (ii) is a company listed by the Texas Comptroller of Public Accounts under Sections 806.051, 807.051, or 2252.153 of the Texas Government Code. The term "foreign terrorist organization" in this paragraph has the meaning assigned to such term in Section 2252.151 of the Texas Government Code.

Individual by oath swears that the following statements are factual and true:

1. Individual is authorized by the Contractor to make this statement for the Contractor.
2. Individual has read and is fully aware of the facts stated in this statement.
3. Individual can read and comprehend the English language.
4. As required by GOVERNMENT CODE, CHAPTER 2252.152, CONTRACTOR hereby verifies that it is not identified on a list prepared and maintained under Section 806.051, 807.051, or 2252.153, or contracting with a company doing business with Iran, Sudan, or any foreign terrorist organizations.

Date: _____

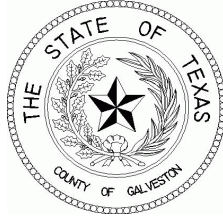
Business Name of Contractor: _____

Company Address: _____

County of Contractor: _____

Name of Individual: _____

Signature of Individual: _____



ATTACHMENT G INFORMATION FOR NOTICE

Solicitation Number: RFP #B241016

Solicitation Title: Gulf Coast Mental Health Crisis Unit Construction

Respondent shall use this form to provide the information for notice.

1. Contact information for notice:

Name: _____

Address: _____

Telephone Number: _____ Facsimile number: _____

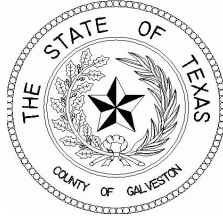
2. If a copy of notice is requested, please complete below:

Name: _____

Address: _____

Telephone Number: _____ Facsimile number: _____

3. If second or more copies are requested for notice, please supplement this form, and clearly mark the supplement as "Supplementary Notice Information."



ATTACHMENT H REFERENCES

Solicitation Number: RFP #B241016

Solicitation Title: Gulf Coast Mental Health Crisis Unit Construction

Respondent shall use this form to provide **three (3) references who can attest to the Respondent's capability to carry out the requirements set forth in this qualification request.** If Respondent wishes to provide more than the minimum, Respondent should supplement this form and should clearly mark the supplement as "Supplementary Reference Information."

1. Business Name of Organization: _____

Name of Person: _____

Title of Individual within Organization, if applicable: _____

Business address: _____

Telephone Number: _____ Facsimile number: _____

2. Business Name of Organization: _____

Name of Person: _____

Title of Individual within Organization, if applicable: _____

Business address: _____

Telephone Number: _____ Facsimile number: _____

3. Business Name of Organization: _____

Name of Person: _____

Title of Individual within Organization, if applicable: _____

Business address: _____

Telephone Number: _____ Facsimile number: _____

SPECIAL PROVISIONS FOR CONSTRUCTION

1. Contract and Contract Documents

The Plans, Specifications and Addenda, General Provisions shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth.

2. Definitions

Whenever used in any of the contract Documents, the following meanings shall be given to the terms here in defined:

- (a) The term "Contract" means the Contract executed between the County of Galveston, hereinafter called the Owner, and _____, hereinafter called Contractor, of which these GENERAL CONDITIONS, form a part.
- (b) The term "Project Area" means the area within which are the specified Contract limits of the Improvements contemplated to be constructed in whole or in part under this contract.
- (c) The term "Engineer" means **Galveston County**, Engineer in charge, serving the Owner with architectural or engineering services, his successor, or any other person or persons, employed by the Owner for the purpose of directing or having in charge the work embraced in this Contract.

The term "Contract Documents" means and shall include the following: Invitation to Bid, General Provisions, Special Provisions, Prohibition on Contracts with Certain Companies, Prohibition on Contracts with Companies Boycotting Israel, Certification Regarding Lobbying, Non-Collusion Affidavit, Contractor's Certification Regarding Lobbying, Bid Forms, Debarment Form, Vendor Qualification Packet, Special Provisions for Construction, Bid Proposal, Affidavit and Surety Forms, Wage Rates, Technical Specifications, Plans and any Addenda.

- (d) The term "Substantially Complete" shall mean that the work is fully completed with the exception of minor miscellaneous work and adjustments.

3. Supervision By Contractor

- (a) Except where the Contractor is an individual and gives his personal supervision to the work, the Contractor shall provide a competent superintendent, satisfactory to the Local Public Agency and the Engineer, on the work at all times during working hours with full authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expediting of his work.
- (b) The Contractor shall lay out his own work and he shall be responsible for all work executed by him under the Contract. He shall verify all figures and elevations before proceeding with the work and will be held responsible for any error resulting from his failure to do so.

4. Subcontracts

- (a) The Contractor shall not execute an agreement with any subcontractor or permit any subcontractor to perform any work included in this contract until he has verified the subcontractor as eligible to participate in federally funded contracts.
- (b) No proposed subcontractor shall be disapproved by the city/county except for cause.

- (c) The Contractor shall be as fully responsible to the city/county for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them.
- (d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work and required compliance by each subcontractor with the applicable provisions of the Contract.
- (e) Nothing contained in the Contract shall create any contractual relation between any subcontractor and the Owner.

5. Fitting and Coordination of Work

The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, subcontractors, or material suppliers engaged upon this Contract.

6. Payments to Contractor

(a) Partial Payments

- 1) The Contractor shall prepare his requisition for partial payment as of the last day of the month and submit it, with the required number of copies, to the Engineer for his approval. The amount of the payment due the Contractor shall be determined by adding to the total value of work completed to date, the value of materials properly stored on the site and deducting (1) Five percent (5%) of the total amount, to be retained until final payment and (2) the amount of all previous payments. The total value of work completed to date shall be based on the estimated quantities of work completed and on the unit prices contained in the agreement. The value of materials properly stored on the site shall be based upon the estimated quantities of such materials and the invoice prices. Copies of all invoices shall be available for inspection of the Engineer.
- 2) Monthly or partial payments made by the Owner to the Contractor are moneys advanced for the purpose of assisting the contractor to expedite the work of construction. The Contractor shall be responsible for the care and protection of all materials and work upon which payments have been made until final acceptance of such work and materials by the Owner. Such payments shall not constitute a waiver of the right of the Owner to require the fulfillment of all terms of the Contract and the delivery of all improvements embraced in this Contract complete and satisfactory to the Owner in all details.

(b) Final Payment

- 1) After final inspection and acceptance by the Owner of all work under the Contract, the Contractor shall prepare his requisition for final payment which shall be based upon the careful inspection of each item of work at the applicable unit prices stipulated in the Agreement. The total amount of the final payment due the Contractor under this contract shall be the amount computed as described above less all previous payments.
- 2) The Owner before paying the final estimate, shall require the Contractor to furnish releases or receipts from all subcontractors having performed any work and all persons having supplied materials, equipment (installed on the Project) and services to the Contractor, if the Owner deems it necessary in order to protect its interest. The Owner may, if it deems such action advisable, make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments made shall in no way impair the obligations of any surety or sureties furnished under this Contract.
- 3) Any amount due the Owner under Liquidated Damages shall be deducted from the final payment due the contractor.

(c) Payments Subject to Submission of Certificates

Each payment to the Contractor by the Owner shall be made subject to submission by the Contractor of all written certifications required of him and his subcontractors.

(d) **Withholding Payments**

The Owner may withhold from any payment due the Contractor whatever is deemed necessary to protect the Owner, and if so elects, may also withhold any amounts due from the Contractor to any subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Owner and will not require the Owner to determine or adjust any claims or disputes between the Contractor and his subcontractors or material dealers, or to withhold any moneys for their protection unless the Owner elects to do so. The failure or refusal of the Owner to withhold any moneys from the Contractor shall in no way impair the obligations of any surety or sureties under any bond or bonds furnished under this Contract.

7. Changes in the Work

- (a) The Owner may make changes in the scope of work required to be performed by the Contractor under the Contract without relieving or releasing the Contractor from any of his obligations under the Contract or any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the guaranty bonds, and without relieving or releasing the surety or sureties of said bonds. All such work shall be executed under the terms of the original Contract unless it is expressly provided otherwise.
- (b) Except for the purpose of affording protection against any emergency endangering health, life, limb or property, the Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the improvements or supply additional labor, services or materials beyond that actually required for the execution of the Contract, unless in pursuance of a written order from the Owner authorizing the Contractor to proceed with the change. No claim for an adjustment of the Contract Price will be valid unless so ordered.
- (c) If applicable unit prices are contained in the Agreement, the Owner may order the Contractor to proceed with desired unit prices specified in the Contract; provided that in case of a unit price contract the net value of all changes does not increase the original total amount of the agreement by more than twenty-five percent (25%) or decrease the original the total amount by eighteen percent (18%).
- (d) Each change order shall include in its final form:
 - 1) A detailed description of the change in the work.
 - 2) The Contractor's proposal (if any) or a confirmed copy thereof.
 - 3) A definite statement as to the resulting change in the contract price and/or time.
 - 4) The statement that all work involved in the change shall be performed in accordance with contract requirements except as modified by the change order.
 - 5) The procedures as outlined in this Section for a unit price contract also apply in any lump sum contract.

8. Estimated Quantities

This Contract, including the specifications, plans and estimates, is intended to show clearly all the work to be done and material to be furnished hereunder. The estimated quantities of the various classes of work to be done and material to be furnished under this contract are approximate and are to be used as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It is understood and agreed that the actual amount of work to be done and material to be furnished under this contract may differ somewhat from

these estimates, and that the basis for payment under this contract shall be the plan quantity or actual amount of such work done whichever is specified. It is further understood that the County does not guarantee any minimum amount of work under this Contract.

Contractor agrees that it will make no claim for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this Contract and the estimated quantities contemplated and contained in the proposals.

9. Claims for Extra Cost

- (a) If the Contractor claims that any instructions by Drawings or otherwise involve extra cost or extension of time, he shall, within ten days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the Owner, stating clearly and in detail the basis of his objections. No such claim will be considered unless so made.
- (b) Claims for additional compensation for extra work, due to alleged errors in ground elevations, contour lines, or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material, or performing more work, than would be reasonably estimated from the Drawings and maps issued.
- (c) Any discrepancies which may be discovered between actual conditions and those represented by the Drawings and maps shall be reported at once to the Owner and work shall not proceed except at the Contractor's risk, until written instructions have been received by him from the Owner.
- (d) If, on the basis of the available evidence, the Owner determines that an adjustment of the Contract Price and/or time is justifiable, a change order shall be executed.

10. Time

The Contractor is advised that time for completion will consist of the number of calendar days set out in the Contract Award. The time for completion will begin to run on the day after the issuance of a notice to proceed by the County. The Contractor is required to start work no later than ten (10) working days after the issuance of the written notice to proceed. Failure to timely commence operations may be deemed by the County to be a default. The Contractor will complete the work at that site within the time period specified. If there is more than one site listed on the notice to proceed, work for all sites must be completed not later than is specified for each site.

11. Termination, Delays, and Liquidated Damages

- (a) Right of the Owner to Terminate Contract.

In the event that any of the provisions of this contract are violated by the Contractor, or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract. The notices shall contain the reasons for such intention to terminate the contract, and unless such violation or delay shall cease and satisfactory arrangement of correction be made within ten days, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor. The Surety shall have the right to take over and perform the contract. Provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and complete the project by bid/contract or by force account at the expense of the Contractor and his Surety shall be liable to the Owner for any excess cost incurred. In such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

(b) **Liquidated Damages for Delays.**

Contractor agrees that time is of the essence of this contract and that for each day of a delay of a day beyond the number of working days or calendar days herein agreed upon the completion of the work herein specified and contracted for (after due allowance for such extension of time as is provided for under Extension of Time hereinabove) County may withhold permanently from Contractor's total compensation the sum of \$1,000.00 for each calendar day of delay, until the work is completed, as liquidated damages for such delay. The Contractor and his sureties shall be liable to the Owner for the amount thereof.

(c) **Excusable Delays.**

- 1) The right of the Contractor to proceed shall not be terminated nor shall the Contractor be charged with liquidated damages for any delays in the completion of the work due to:
 - a. Any acts of the Government, including controls or restrictions upon or requisitioning of materials, equipment, tools, or labor by reason of war, national defense, or any other national emergency;
 - b. Any acts of the Owner;
 - c. Causes not reasonably foreseeable by the parties to this Contract at the time of the execution of the Contract which are beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, acts of another Contractor in the performance of some other contract with the Owner, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and weather of unusual severity such as hurricanes, tornadoes, cyclones and other extreme weather conditions.
- 2) Provided, however, that the Contractor promptly notifies the Owner within ten (10) days in writing of the cause of the delay. Upon receipt of such notification, the Owner shall ascertain the facts and the cause and extent of delay. If, upon the basis of the facts and the terms of this contract, the delay is properly excusable, the Owner shall extend the time for completing the work for a period of time commensurate with the period of excusable delay.

12. Assignment or Novation

The Contractor shall not assign or transfer, whether by an assignment or novation, any of its rights, duties, benefits, obligations, liabilities, or responsibilities under this Contract without the written consent of the Owner; provided, however, that assignments to banks or other financial institutions may be made without the consent of the Owner. No assignment or novation of this Contract shall be valid unless the assignment or novation expressly provides that the assignment of any of the Contractor's rights or benefits under the Contract is subject to a prior lien for labor performed, services rendered, and materials, tools, and equipment supplied for the performance of the work under this Contract in favor of all persons, firms, or corporations rendering such labor or services or supplying such materials, tools, or equipment.

13. Disputes

- (a) All disputes arising under this Contract or its interpretation except those disputes covered by FEDERAL LABOR STANDARDS PROVISIONS whether involving law or fact or both, or extra work, and all claims for alleged breach of contract shall, within ten (10) days of commencement of the dispute, be presented by the Contractor to the Owner for decision. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt of the Owner.
- (b) The Contractor shall submit in detail his claim and his proof thereof.

- (c) If the Contractor does not agree with any decision of the Owner, he shall in no case allow the dispute to delay the work but shall notify the Owner promptly that he is proceeding with the work under protest.

14. Technical Specifications and Drawings

Anything mentioned in the Technical Specifications and not shown on the Drawings, or vice versa, shall be of like effect as if shown on or mentioned in both. In case of difference between Drawings and Technical Specifications, the Technical Specifications shall govern. In case of any discrepancy in Drawings, or Technical Specifications, the matter shall be immediately submitted to the Owner, without whose decision, said discrepancy shall not be adjusted by the Contractor, save only at his own risk and expense.

15. Shop Drawings

- (a) All required shop drawings, machinery details, layout drawings, etc. shall be submitted to the Engineer in copies for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting and rechecking if necessary. The Contractor may proceed, only at his own risk, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved and no claim, by the Contractor, for extension of the contract time shall be granted by reason of his failure in this respect.
- (b) Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of contract price and/or time, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though the drawings have been approved.
- (c) If a shop drawing is in accordance with the contract or involves only a minor adjustment in the interest of the owner not involving a change in contract price or time; the engineer may approve the drawing. The approval shall not relieve the Contractor from his responsibility for adherence to the contract or for any error in the drawing.

16. Requests for Supplementary Information

It shall be the responsibility of the Contractor to make timely requests of the Owner for any additional information not already in his possession which should be furnished by the Owner under the terms of this Contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need approaches, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the Contractor. The first list shall be submitted within two weeks after Contract award and shall be as complete as possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the Contractor. The Contractor shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provision of this section.

17. Materials and Workmanship

- (a) Unless otherwise specifically provided for in the technical specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the technical specifications as "equal to" any particular standard, the Engineer shall decide the question of equality.
- (b) The Contractor shall furnish to the Owner for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full

information as to type, performance characteristics, and all other pertinent information as required, and shall likewise submit for approval full information concerning all other materials or articles which he proposes to incorporate.

- (c) Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at the risk of subsequent rejection.
- (d) Materials specified by reference to the number or symbol of a specific standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade, or modified in the technical specifications shall have full force and effect as though printed therein.
- (e) The Owner may require the Contractor to dismiss from the work such employee or employees as the Owner or the Engineer may deem incompetent, or careless, or insubordinate.

18. Samples, Certificates and Tests

- (a) The Contractor shall submit all material or equipment samples, certificates, affidavits, etc., as called for in the contract documents or required by the Engineer, promptly after award of the contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.
- (b) Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in making a prompt decision regarding the acceptability of the sample. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.
- (c) Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with Contract requirements. After actual deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.
- (d) Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:
 - 1) The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes, except those samples taken on the project by the Engineer;
 - 2) The Contractor shall assume all costs of re-testing materials which fail to meet contract requirements;
 - 3) The Contractor shall assume all costs of testing materials offered in substitution for those found deficient;
 - 4) The Owner will pay all other expenses.

19. Permits and Codes

- (a) The Contractor shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers. Before installing any work, the Contractor shall examine the drawings and technical specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the Owner. Where the requirements of the drawings and technical specifications fail to comply with such applicable ordinances or codes, the Owner will adjust the Contract by Change Order to conform to such ordinances or codes (unless waivers in writing covering the difference have been granted by the governing body or department) and make appropriate adjustment in the Contract Price or stipulated unit prices.
- (b) Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility at variance with any applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the drawings and technical specifications), the Contractor shall remove such work without cost to the Owner.
- (c) The Contractor shall at his own expense, secure and pay for all permits for street pavement, sidewalks, shed, removal of abandoned water taps, sealing of house connection drains, pavement cuts, buildings, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.
- (d) The Contractor shall comply with applicable local laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespass on any public or private property in any operation due to or connected with the Improvements contained in this Contract.
- (e) The Contractor will be required to make arrangements for and pay the water, electrical power, or any other utilities required during construction.
- (f) During construction of this project, the Contractor shall use every means possible to control the amount of dust created by construction. Prior to the close of a day's work, the Contractor, if directed by the Owner, shall moisten the bank and surrounding area to prevent a dusty condition.

20. Care of Work

- (a) The Contractor shall be responsible for all damages to person or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance.
- (b) The Contractor shall provide sufficient competent watchmen, both day and night, including Saturdays, Sundays, and holidays, from the time the work is commenced until final completion and acceptance.
- (c) In an emergency affecting the safety of life, limb or property, including adjoining property, the Contractor, without special instructions or authorization from the Owner is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by the Owner.
- (d) The Contractor shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc., and he shall at his own expense completely repair any damage thereto caused by his operations.
- (e) The Contractor shall shore up, brace, underpin, secure, and protect as maybe necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements included in this Contract. The Contractor shall be responsible for the giving of any and all required notices

to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which the Owner may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

21. Accident Prevention

- (a) No laborer or mechanic employed in the performance of this Contract shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety as determined under construction safety and health standards promulgated by the Secretary of Labor.
- (b) The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work.
- (c) The Contractor shall maintain an accurate record of all cases of death, occupational disease, or injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Owner with reports concerning these matters.
- (d) The Contractor shall indemnify and save harmless the Owner from any claims for damages resulting from property damage, personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this contract.
- (e) The Contractor shall provide trench safety for all excavations more than five feet deep prior to excavation. All OSHA Standards for trench safety must be adhered to by the Contractor.
- (f) The contractor shall at all times conduct his work in such a manner as to insure the least possible inconvenience to vehicular and pedestrian traffic. At the close of the work each day, all streets where possible in the opinion of the Owner, shall be opened to the public in order that persons living in the area may have access to their homes or businesses by the use of the streets. Barricades, warning signs, and necessary lighting shall be provided to the satisfaction of the Owner at the expense of the Contractor.

22. Sanitary Facilities

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations.

23. Use of Premises

- (a) The Contractor shall confine his equipment, storage of materials, and construction operations to the contract limits as shown on the drawings and as prescribed by ordinances or permits, or as may be desired by the Owner, and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.
- (b) The Contractor shall comply with all reasonable instructions of the Owner and all existing state and local regulations regarding signs, advertising, traffic, fires, explosives, danger signals, and barricades.

24. Removal of Debris, Cleaning, Etc.

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights of way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for work, and put the whole site of the work and public rights of way in a neat and clean condition.

25. Inspection

- (a) All materials and workmanship shall be subject to inspection, examination, or test by the Owner and Engineer at any and all times during manufacture or construction and at any and all places where such manufacture or construction occurs. The Owner shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge. If the Contractor fails to proceed at once with the correction of rejected workmanship or defective material, the Owner may by contract or otherwise have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any Monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.
- (b) The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the Owner will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the technical specifications.
- (c) The Contractor shall notify the Owner sufficiently in advance of back filling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the Owner, the Contractor shall uncover for inspection and recover such facilities at his own expense, when so requested by the Owner.
- (d) Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.
- (e) Inspection of materials and appurtenances to be incorporated in the improvements included in this Contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such inspection and acceptance, unless otherwise stated in the technical specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.
- (f) Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the Owner or its agents shall relieve the Contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

26. Review by Owner

The Owner and its authorized representatives and agents shall have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract, provided, however that all instructions and

approval with respect to the work will be given to the Contractor only by the Owner through its authorized representatives or agents.

27. Final Inspection

When the Improvements included in this Contract are substantially completed, the Contractor shall notify the Owner in writing that the work will be ready for final inspection on a definite date which shall be stated in the notice. The Owner will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable.

28. Deduction for Uncorrected Work

If the Owner deems it not expedient to require the Contractor to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the Contractor and the Owner and subject to settlement, in case of dispute, as herein provided.

29. Warranty of Title

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which an interest is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed by him to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm, or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

30. Warranty of Workmanship and Materials

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements included in this Contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of 12 months from the date of final acceptance of the work.

31. Job Offices

- (a) The Contractor and his subcontractors may maintain such office and storage facilities on the site as are necessary for the proper conduct of the work. These shall be located so as to cause no interference to any work to be performed on the site. The Owner shall be consulted with regard to locations.
- (b) Upon completion of the improvements, or as directed by the Owner, the Contractors shall remove all such temporary structures and facilities from the site, and leave the site of the work in the condition required by the contract.

32. Partial Use of Site Improvements

The Owner may give notice to the Contractor and place in use those sections of the improvements which have been completed, inspected and can be accepted as complying with the technical specifications and if in its

opinion, each such section is reasonably safe, fit, and convenient for the use and accommodation for which it was intended, provided:

- (a) The use of such sections of the Improvements shall in no way impede the completion of the remainder of the work by the Contractor.
- (b) The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.
- (c) The period of guarantee stipulated in the Section 29 hereof shall not begin to run until the date of the final acceptance of all work which the Contractor is required to construct under this Contract.

33. Contract Period

The work to be performed under this contract shall commence within the time stipulated by the Owner in the Notice to Proceed, and shall be fully completed within 180 calendar days thereafter.

34. Keeping Of Plans And Specifications Accessible

The Contractor shall keep one (1) copy of all Plans and Specifications constantly accessible at the work site and available for inspection at all times.

35. Utilities

Contractor shall be responsible for any charges which may be made by any city or utility companies for the work to be performed by Contractor.

36. Parking

Contractor shall be responsible for the expense of parking the Contractor's vehicle(s) in a legal manner and at no expense or inconvenience to the County.

37. Fire And Safety

Contractor is completely responsible for fire protection at the job site as well as the safety of its own employees as well as those entering onto the job site.

38. Contractor's Buildings

The building of structures for housing men, or the erection of tents or other forms of protection will be permitted only at such places as the County shall permit, and the sanitary conditions of the grounds in or about such structures shall at all times be maintained in the manner satisfactory to the County.

39. Worksite Security

Contractor shall maintain the security of the worksite.

Contractor shall provide adequate protection to persons on the worksite, adjacent properties, and utilities as is necessary to keep each free of damage or injury. Contractor shall furnish all barricades, warning lights and other safety devices necessary for the safety and protection of the public and shall remove them upon completion of the work performed on those premises under the terms of this contract.

Contractor will have complete control over the work site and shall be fully responsible for any loss of or damage to any County property from any cause and will reimburse County in the event of any loss or damage to County's

property from any cause.

Contractor shall take proper means to protect adjacent or adjoining properties which might be injured or seriously affected by construction undertaken under this Agreement from any damage or injury by reason of said process of construction. Contractor shall be liable for any and all claims for such damage on account of its failure to fully protect all adjoining properties.

40. Final Grading

If grading is required, when work is complete, Contractor shall grade the site to fill in holes and make a presentable appearance without disturbing trees and add fill dirt if needed. Contractor may not leave voids in the grading and compaction of the property. The land shall have a smooth appearance without concrete, bricks, building materials, and other debris on the surface.

41. Changes And Alterations

Contractor further agrees that County may make such changes and alterations as County may see fit, in the line, grade, form dimensions, plans or materials for the work herein contemplated, or any part thereof, either before or after the beginning of the contract construction, without affecting the validity of this Contract and the accompanying bonds.

If such changes or alterations diminish the quantity of the work to be done, they shall not constitute the basis for a claim for damages, or anticipated profits on the work that may be dispensed with. If they increase the amount of the work, and the increased work can fairly be classified under the specifications, such increase shall be paid for according to the quantity actually done and at the unit price established for such work under this contract; otherwise such additional work shall be paid for as provided under the paragraph entitled "EXTRA WORK". In case the County shall make such changes or alterations as shall make useless any work already done or material already furnished or used in said work, then County shall recompense Contractor for any material or labor so used, and for any actual loss occasioned by such change due to actual expenses incurred in preparation for the work as originally planned.

42. Extra Work

The term "Extra Work" as used in this contract shall be understood to mean and include all work that may be required by the County to be done by Contractor to accomplish any change, alteration or addition to the work shown in the plans and specifications.

It is agreed that Contractor shall perform all Extra Work under the direction of the County when presented with a Written Work Order signed by the County. It is also agreed that the compensation to be paid Contractor for performing said Extra Work shall be determined by one or more of the following methods:

- Method (a) - By agreed unit prices; or
- Method (b) - By agreed lump sum: or
- Method (c) - If Neither Method (a) nor Method (b) can be agreed upon before the Extra Work is commenced, then Contractor shall be paid the "Actual field cost" of the work plus fifteen (15) percent.

In the event said Extra Work be performed and paid for under Method (c), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost of all workmen, such as foremen, timekeepers, merchants, and laborers, and materials, supplies, teams, trucks, rentals on machinery and equipment for time actually employed or used on such Extra Work plus actual transportation charges necessarily incurred, if the kind of equipment or machinery is not already on the job, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work including Social Security, Old Age Benefits and other payroll taxes, and a ratable proportion of premiums on Construction and Maintenance Bonds, Public Liability and Property Damage and

Workmen's Compensation, and all other insurance as may be required by any law or ordinance. The County may direct the form in which accounts of the "actual field cost" shall be kept and may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used, otherwise these matters shall be determined by Contractor. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using the one hundred (100) percent of the actual hourly or daily rate (for the time used plus time in moving to and from Job) of the latest schedule of Equipment Ownership Expense adopted by the Association General Contractors of America. Where practicable the terms and prices for the use of Machinery and Equipment shall be incorporated in the Written Extra Work Order. The fifteen (15) percent of the "Actual Field Cost" to be paid Contractor shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the "actual field cost" as herein defined, save that where the Contractor's Camp or Field Office must be maintained primarily on account of such extra work, then the cost to maintain and operate same shall be included in the "actual field cost".

No claim for extra work of any kind will be allowed unless ordered in writing by the County. In case any orders or instructions, either oral or written appear to Contractor to involve extra work for which he should receive compensation, it shall make written request to the County for written order authorizing Extra Work. Should a difference of opinion arise as to what does or does not constitute extra work, or as to the payment therefor, and the County insists upon its performance, Contractor shall proceed with the work after making written order and shall keep an accurate account of the "actual field cost" thereof, as provided under Method (c) and by this action Contractor will thereby preserve the right to submit the matter of payment to litigation.

43. Salvage

Any materials, equipment and fixtures specifically ordered to be salvaged under these specifications shall remain the property of County and will be delivered to the site designated by the County. All other items shall be disposed of by Contractor in compliance with all applicable laws and regulations.

44. Compliance With Codes

Contractor shall comply with all city, county, and state codes, laws, and ordinances in force at the time of award of contract and applicable to such work. Contractor shall obtain, at Contractor's own expense such permits, certificates, and licenses as may be required in the performance of the specified work.

45. Laws And Ordinances

Contractor shall at all times observe and comply with all Federal, State and Local Laws, ordinances and regulations which in any manner effect the contract or the work, and shall indemnify and save harmless the County against any claim arising from the violation of any such laws and ordinances, whether by Contractor or its employees.

46. Permits And Licenses

Contractor shall be responsible for obtaining and furnishing all necessary permits and licenses, City, County, State or Federal as are required for the performance of this contract.

47. Lines And Grades

The Engineer will furnish points for horizontal and vertical control. Any additional stakes required by the Contractor shall be set at his expense. Whenever necessary, work shall be suspended to permit this work, but such suspension will be as brief as practicable and the Contractor shall be allowed no extra compensation therefor. The Contractor shall give the Engineer ample notice of the time and place where control lines and bench marks will be needed. All control stakes, marks, etc. shall be carefully preserved by the Contractor, and in case of careless destruction or removal by him or his employees, such control stakes, marks, etc. shall be

replaced by the Engineer at the Contractor's expense.

48. Excess, Waste Material And Debris

All excess material, waste material and debris shall become the property of the Contractor and shall be properly disposed of off-site. No separate payment shall be made for same.

49. Material Hauling

Hauling of materials will not be paid for directly, but shall be considered as subsidiary work pertaining to the respective bid items. Haul routes for full and empty loads shall be restricted to State Highways. Hauling of equipment is also restricted to State Highways.

50. Abatement And Mitigation Of Excessive Or Unnecessary Construction Noise

Throughout all phases of the construction of this project, including the moving, unloading, operating and handling of construction equipment prior to commencement of work, during the project and after the work is complete, the contractor shall make every reasonable effort to minimize the noise imposed upon the immediate neighborhood surrounding the area of construction. Particular and special efforts shall be exercised by the Contractor to avoid the creation of unnecessary noise impacts on adjacent sensitive receptors in the placement of non-mobile equipment such as air compressors, generators, pumps, etc. The placement of temporary parked mobile equipment with the engine running shall be such as to cause the least disruption of normal adjacent activities not associated with the work to be performed by the contractor.

All equipment associated with the work shall be equipped with components designed by the manufacturer wholly or in part to suppress excessive noise and these components shall be maintained in their original operating condition considering normal depreciation. Noise-attenuation devices installed by the manufacturer such as mufflers, engine covers, insulation, etc., shall not be removed nor rendered ineffectual nor be permitted to remain off the equipment while the equipment is in use.

51. Working Hours

Work shall not be commenced by the contractor before sunrise and shall be so conducted that all equipment is off the road and safely stored by sunset. Specific permission shall be obtained by the contractor from the Engineer for work during those hours between 7:00 P.M. and 6:00 A.M. of the following day.

52. Pipeline, Utility Locations And Contractor Responsibility

An effort to determine all pipelines and utilities which may impact the project has been made. All known pipelines and utilities have been approximately located and shown on the plans. The Contractor shall notify all utility and pipeline owners before beginning the work. Additional unknown utilities and pipelines may be found. Adjustments of these utilities or pipelines shall be done by others at no expense to the contractor. However, the Contractor shall cooperate and coordinate his work with the adjustment

The Contractor will anticipate this in making his bid. The contractor will not be allowed claims for damages or delays for these adjustments should they be necessary. However, additional time will be considered for the contract period.

This action, however, shall in no way be interpreted as relieving the Contractor of his responsibilities under the terms of the contract as set out in the plans and specifications. The Contractor shall repair any damage to the facilities caused by his operations at the Contractor's expense and shall restore facilities to service in a timely manner.

53. Incidentals

All items of work required under this contract not specifically called for in the proposal as pay items shall be considered incidental to the various bid items and no separate payment shall be made for same.

54. Flagmen

During certain phases of construction flagmen will be required to direct and control traffic. This work will not be paid for directly, but shall be considered incidental the various bid items and no separate payment shall be made for same.

55. Field Office

For this project the Contractor will not have to provide a field office.

56. Wage Rates:

The attached schedule of wages per hour for this Contract follows.

CONSENT OF SURETY TO REDUCTION IN OR PARTIAL RELEASE OF RETAINAGE

TO:

PROJECT NO.

PROJECT:

RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction

CONTRACT FOR:

CONTRACT DATE:

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

, SURETY,

On bond of (here insert name and address of Contractor as it appears in the bond)

, CONTRACTOR,

Hereby approves the reduction in or partial release of retainage to the contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to (here insert name and address of Owner)

, OWNER,

As set forth in the said Surety's bond

IN WITNESS WHEREOF,

The Surety has hereunto set its had this

day of

2024,

SURETY

Signature of Authorized Representative

Title

ATTEST:

(Seal):

CONTRACTOR’S AFFIDAVIT OF RELEASE OF LIEN:

TO (Owner):

PROJECT NO:

CONTRACT FOR:

PROJECT:

CONTRACT DATE:

RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction

State of:

County of:

The undersigned, hereby certifies that, to the best of his knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS: (If none, write “None”. If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each exception)

SUPPORTING DOCUMENTS ATTACHED HERETO:

Contractor:

1. Contractor’s Release or Waiver of Liens, Conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Sub-contractors and material and equipment Suppliers, to the extent required by the Owner, accompanied by a list thereof.

Address:

BY:

Subscribed and sworn to before me this day of _____, 2024.

Notary Public:

My Commission Expires:

CONTRACTOR’S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

TO (Owner):

PROJECT NO:

CONTRACT FOR:

PROJECT:

CONTRACT DATE:

RFP #B241016, Gulf Coast Mental Health Crisis Unit Construction

State of:

County of:

The undersigned, hereby certifies that, except as listed below, he has paid in full or has otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible.

EXCEPTIONS: (If none, write “None”. If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each exception.)

SUPPORTING DOCUMENTS ATTACHED HERETO:

CONTRACTOR:

1. Consent of Surety to Final Payment.
Whenever Surety is involved, consent of Surety is required. CONSENT OF SURETY, may be used for this purpose.
Indicate attachment; yes _____ no _____

Address:

The following supporting documents should be Attached hereto if required by the Owner:

BY:

1. Contractor’s Release or Waiver of Liens, Conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Sub-contractors and material and equipment Suppliers to the extent required by the Owner, Accompanied by a list thereof.
3. Contractor’s Affidavit of Release of Lien.

Subscribed and sworn to before me this

day of _____ 2024.

Notary Public:

My Commission Expires:

CONSENT OF SURETY COMPANY TO FINAL PAYMENT

TO (Owner):

PROJECT NO:

CONTRACT FOR:

PROJECT:

CONTRACT DATE:

RFP #B241016 Gulf Coast Mental Health Crisis Unit Construction

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the (here insert name and address of Surety at it appears in the bond)

, SURETY COMPANY.

On bond of (here insert name and address of Contractor)

, CONTRACTOR,

Hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of its obligations to (here insert name and address of Owner)

, OWNER,

As set forth in the said Surety Company's bond.

IN WITNESS WHEREOF, _____ day of _____, 2024.

Surety Company

Signature of Authorized Representative

Title

ATTEST:
(Seal)

NOTE: This form is to be used as a companion document to Contractor's Affidavit of Payment of Debts and Claims.

CONTRACT AWARD

CONTRACT FOR: _____

THIS CONTRACT IS ENTERED INTO BETWEEN GALVESTON COUNTY AND THE CONTRACTOR NAMED BELOW PURSUANT TO SUBCHAPTER B, CHAPTER 271, TEXAS LOCAL GOVERNMENT CODE, AND THE REFERENCED INVITATION TO BID.

Contract No: _____

Bid No: _____ RFP #B241016 _____

Contractor: _____

The Specifications and Drawings are enumerated as follows:

Standard Specifications:

Special Provisions:

Special Item:

DRAWINGS:

ADDENDA: _____

CONTRACT AWARD

Request for Proposal; General Provisions; Special Provisions, Proposal Forms, Non-Collusion Affidavit, Lobbying Form, Vendor Qualification Packet, Debarment Form, Instructions to Bidders; Bid Proposal; Contract Award, Special Terms and Conditions, including Addenda, Wage Rates & Affidavit and Surety Forms, General Terms and Condition, Specifications and (Plans), attached to this Contract Award are all made a part of this Contract and collectively evidence and constitute the entire contract. Contractor shall furnish all materials, perform all of the work required to be done and to everything else required by these documents.

Time of Completion: The Contractor shall complete the work within _____ Calendar Days of the issuance of the notice to proceed. The time set forth for completion of the work is an essential element of the Contract.

The Contract Sum: The County shall pay the Contractor for performance of the Contract, the sum of _____ Dollars and No/100 (\$ _____), payments to be made as described herein.

Performance Bond required: () yes () no

Payment Bond required: () yes () no

This Contract is issued pursuant to award made by Commissioners' Court on _____, 20____.
EXECUTED this _____ day of _____, 20_____.

COUNTY OF GALVESTON, TEXAS

BY: _____
MARK HENRY, County Judge

ATTEST:

DWIGHT SULLIVAN, County Clerk

CONTRACTOR

BY: _____
Signature-Title

Printed Name

**GALVESTON COUNTY
STANDARD AGREEMENT
FOR BUILDING CONSTRUCTION AND RELATED WORK**

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END

SECTION 1. DEFINITION OF TERMS

1.01 Definitions. Whenever in this Standard Agreement and in the other Contract Documents, the following terms are used, the intent and meaning shall be interpreted as listed below:

1.02 Addendum. A document issued before receipt of Bids to clarify, revise, add to, or delete from original Bidding Documents, conditions of the Contract, Drawings, Specifications or previous Addenda.

1.03 Agreement. Written accord between the County and the Contractor covering the Work as described in the Contract Documents.

1.04 Bid. The written offer to Galveston County made on the prescribed form by the Bidder to furnish the materials or equipment and/or to perform the Work or services proposed.

1.05 Bid Security. The Bid Bond, cashier's check, certified check or other deposit designated in the Specifications to be made by the Bidder, which is to accompany the Bid as a guaranty of good faith to enter into a written Contract.

1.06 Bidder. Any individual, firm, joint venture, partnership, corporation or other legal entity submitting a Bid.

1.07 Bidding Documents. Instructions to Bidders, Bid form and any Addenda issued by the County to assist Bidders with Bid preparation; used in conjunction with the Contract Documents.

1.08 Bonds. Instruments of Security furnished by the Contractor and its Surety, as required by the Contract Documents, including Bid, Performance, Payment and special Bonds.

1.09 Change Order. A document added after the Contract execution to revise, add to, or delete from the Work and to adjust the Contract sum or Contract time. To be effective, a Change Order must be executed by the Commissioners Court.

1.10 Commissioners Court. The Commissioners Court of Galveston County, Texas.

1.11 Contract. The standard form, consisting of the Bid to Commissioners Court executed by the Contractor and acceptance by the County executed by the County Judge or other named person pursuant to authority granted by Commissioners Court, that binds the County and the Contractor covering the performance of Work or services or the furnishing of materials, supplies, or equipment as proposed. The

Contract shall include the Bid, Drawings, Specifications, general and special provisions, this Standard Agreement, and any and all supplements thereto.

1.12 Contract Documents. The Contract, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice to Proceed), the Bonds, this Standard Agreement, Supplementary Conditions, the Specifications and Drawings, and the Notice to Proceed, together with all amendments, modifications, and supplements issued pursuant to paragraph 5.06 of the Standard Agreement after Contract Time commences.

1.13 Contract Time. The number of calendar days (computed as provided in paragraph 5.03 of the Standard Agreement) or the date stated in the Contract for the completion of the work.

1.14 Contractor. The individual, firm, joint venture, partnership, corporation or other legal entity with whom a Contract is entered into with the County.

1.15 County. Galveston County, Texas.

1.16 County Auditor. County Auditor of Galveston County, Texas.

1.17 County Judge. County Judge of Galveston County, Texas.

1.18 Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents officially approved by Galveston County, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.19 Payment Bond. A Surety Bond in the amount of the Contract, solely for the protection of all claimants supplying labor and material in the prosecution of the Work provided for in the Contract.

1.20 Performance Bond. A Surety Bond in the amount of the Contract conditioned upon the faithful performance of the Work in accordance with the Drawings, Specifications and Contract Documents. Said Bond is solely for the protection of the County.

1.21 Project Manual. The documents containing, but not limited to, Bidding Documents, Contract Documents, all Specifications, special provisions and this Standard Agreement.

1.22 Purchasing Agent. The Purchasing Agent of Galveston County, Texas.

1.23 Representative. The person designated by the County to provide oversight on behalf of the County. If the County has hired an outside architect or engineer for this project, that architect or engineer is the County's Representative. In the absence of an outside architect or engineer, the Director of Facilities or any other person designated in writing by the Commissioners Court is the Representative. Otherwise, any person designated in writing by the County Judge is the Representative.

1.24 Sample. A physical example furnished by the Contractor to illustrate materials, equipment or workmanship; to establish standards by which the Work will be judged.

1.25 Shop Drawings. Original Drawings prepared by the Contractor, supplier or distributor which illustrate some portion of the Work and which shows fabrication, layout, setting, or erection details.

1.26 Specifications. Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

1.27 Subcontractor. An individual, firm, joint venture, partnership, corporation or other legal entity having a contract with the Contractor or with any Subcontractor for performing a part of the Work.

1.28 Surety. The legal entity which executes the Performance Bond, Payment Bond or Bid Bond, or guarantees the performance of the Bidder or Contractor.

1.29 Work. The entire completed construction or the various separately identifiable parts thereof required to be finished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

SECTION 2. BIDDING AND AWARD

2.01 Intent of Drawings and Specifications. The intent of these Drawings and Specifications is to prescribe definite Work or services to be undertaken, or materials, supplies, or equipment to be furnished by the Bidder if awarded the Contract. The Contract is to be carried out under the observation of the Representative unless otherwise indicated.

In the case of a construction project, the successful Bidder or Contractor shall perform all earthwork, build all structures and incidental construction, and perform extra Work, if necessary, all in accordance with the lines, grades, typical cross-sections, details and dimensions shown on the Drawings and Specifications. The

Contractor shall furnish, unless otherwise provided in the special provisions or in the Contract, all materials, implements, machinery, equipment, tools, supplies and labor necessary to the prosecution and completion of the Contract.

Where the Contractor is to furnish only material, supplies, or equipment, the intent is to prescribe the qualifications, quantity, rate of delivery and location of delivery point or points.

2.02 Interpretation of Drawings and Specifications. Drawings and Specifications provide graphic and written descriptions of the character and scope of the Work. Modifications in the form of Addenda or Change Orders become an integral part of the Drawings and Specifications.

The Contract Documents are complementary; what is required by any one will be binding as if required by all. The Contract Documents are intended to describe the Work. Any Work not described will not be supplied unless reasonably inferred from Contract Documents.

Drawings and Specifications are considered inseparable documents. The Contractor must rely on both documents and must perform the Work according to combined intent.

Organization of Drawings and Specifications does not imply any control over the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed by any trade.

Words which have well known technical or trade meanings have those meanings in relation to materials or Work described in the Contract Documents. Where materials or equipment are specified by a trade or brand name, the intention is not to discriminate against an equal product of another manufacturer, but rather to set a definitive standard of quality or performance. The Representative will be the judge of equivalency. Any substitution of equivalent materials or equipment must be approved in writing by the Representative. The Representative may require a specifically designated material, equipment or process.

Materials specified by reference to other documents, such as Federal Specifications or other recognized standards, must be provided as described in the latest document in effect on the date Bids are received. Where more than one reference is made for a single material, the material may be furnished according to any one of the referred Specifications, at the Contractor's option.

Unless otherwise specified, all materials shall be the best of their respective kinds and shall be in all cases fully equal to approved Samples. All materials

furnished shall be new and free from defects and in accordance with the Specifications applying thereto.

Only Drawing dimensions or dimensions calculated from them will be used by the Contractor. Where the Work is affected by finish dimensions, the Contractor will determine and be responsible for those dimensions. On all Drawings, the figured dimensions shall govern in case of a discrepancy between the figured and scaled dimensions.

The Contractor shall take no advantage of any errors or omissions in the Drawings or Specifications. In the event of a conflict between the Drawings and the Specifications, the Specifications shall control.

2.03 Reference Specifications. When Reference is made in these Specifications to the Specifications of other agencies, organizations or departments, such Reference is made for expediency and standardization, and such Specifications referred to are hereby made a part of these Specifications.

2.04 Special Provisions. Should any construction, Work or condition which is not covered by standard Specifications be anticipated on any proposed work, special provisions for such Work will be attached to, and shall be considered a part of, the Specifications. Should any special provisions conflict with the standard Specifications, the special provisions shall govern.

2.05 Examination of Drawings, Specifications, Special Provisions and Site of Work. When a Bid is submitted, it will be presumed that the Bidder has visited and carefully examined the site of the Work and has made a complete study of the Drawings, Specifications, the Standard Agreement, special provisions and the form of the Contract to be entered into. Information concerning soil boring and water elevations taken on the project site, if available, will be furnished upon request. This information is offered to the Bidder for information purposes only and the County will not be responsible for the information contained therein. This provision is not intended to limit any liability which a third party other than an employee or officer of the County may have to the Contractor.

In the event the Contract covers materials, supplies or equipment, the Contractor is presumed to fully understand the requirements of the County.

If the Contractor encounters conditions or discrepancies differing materially between actual conditions and (1) subsurface or otherwise concealed physical conditions indicated in the Contract Documents or (2) concealed physical conditions of an unusual nature, which are ordinarily anticipated in the construction industry, the Contractor must notify the Representative, document the conditions clearly, and not disturb the conditions in question until the Representative observes and

documents the conditions or discrepancies and provides a written instruction to proceed. The Representative shall make a recommendation to the Commissioners Court as to whether a Change Order with an adjustment to the contract price and/or Contract Time is justified. The Contractor may provide the Representative with a response to the recommendation. The Representative shall submit the recommendation and response to Commissioners Court for consideration, and the Commissioners Court's decision shall be final.

2.06 Measurement of Quantities. All Work completed and materials furnished under the Contract on a unit price Bid shall be measured by the Representative according to United States standard measures, unless otherwise agreed upon in writing. Where applicable, the Contractor shall furnish the County with dray tickets with each load of materials. As a minimum, the tickets shall indicate gross, tare and net weights for each load, and the location of delivery.

2.07 Bid Quantities. On other than lump sum Bid items, the quantities listed on the Bid form are approximate and are to be used only for the comparison of Bids and the preparation of the Contract. Payment on other than lump sum Bid items will be based on the unit price Bid and the actual quantities of materials furnished or Work accomplished.

2.08 Bid. The unit prices Bid on any items shall govern. The unit prices written in words govern over the unit prices written in figures, and errors of extension will be corrected.

2.09 Addenda. The Contractor is responsible for verifying and obtaining all Addenda related to this work.

2.10 Form of Bid and Signature. The Bidder shall state in words and in figures the unit prices or the specific sums, as the case may be, for which it proposes to furnish the material, supplies or equipment or to perform the Work or services required by the Drawings and Specifications.

2.11 Tax Exemptions. The Bidder obligates himself, if awarded the Contract, to use reasonable diligence to obtain for the County any and all exemptions from State or Federal excise or other tax and if required to pay such taxes or if such taxes are paid, to assist the County in any necessary way to obtain refund of such taxes so paid and to execute any required documents necessary to obtain refunds or to assert such exemptions.

2.12 Competency of Bidders. Each Bidder must be capable of performing the various items of Work or services or of furnishing the various items of materials, supplies, or equipment Bid upon.

2.13 Material Guarantee. Before any Contract is Awarded, or before a Notice to Proceed is issued, the Bidder may be required to furnish a complete statement of the names and addresses of suppliers or of the origin, composition and manufacture of any or all materials to be used in the performance of its Bid, together with Samples which may be subjected to the tests provided for in the Specifications to determine their quality and fitness.

2.14 Bonds. The prescribed form of Performance Bond and Payment Bond are available to the Bidder and it is presumed that the Bidder is familiar with them. The Bidder to whom an Award is made shall, within ten (10) calendar days from the date of the Award, execute and deliver to the County any required Performance Bond and Payment Bond, all in the prescribed form. If the Bidder to whom the Award is made fails to furnish a required Performance Bond or Payment Bond as herein provided, the County may rescind its award and acceptance of Contractor's Bid and make an Award to the next lowest responsible Bidder who shall fulfill every stipulation embraced herein as if the first Award were made to it. If this should occur, the Bidder to whom the Award was first made shall at the option of the County, be required to pay to the County the difference between his Bid and that of the next lowest responsible Bidder up to the maximum amount provided in the Bid security for the project. A corporation to which an Award is made will be required to furnish evidence of the authority of the officers executing the Contract. The Performance Bond and the Payment Bond must be accompanied by a valid power of attorney or proper evidence as approved by the County, providing evidence that the person signing on behalf of the Surety is authorized to so act.

A firm or partnership to which an Award is made will be required to furnish evidence of the authority of the person executing the Bid satisfactory to the County. The Performance Bond and Payment Bond shall be on the forms prescribed by the County, for the full sum of the Contract and shall be executed by the Contractor and a surety company authorized to do business in Texas with an agency or home office in Texas. The Performance Bond and the Payment Bond must be accompanied by a valid power of attorney providing evidence that the person signing on behalf of the Surety is authorized to so act.

2.15 Notice to Proceed. Upon execution of the Contract, or later as required by the unique needs of the Work and upon mutual agreement, the County's Representative shall prepare and transmit to the Contractor a Notice to Proceed indicating a date the Contractor shall begin Work.

The time fixed for performance of Contract, (Contract Time) shall begin to run from the date fixed in the Notice to Proceed.

2.16 Warranty of Title. No material, supplies, or equipment to be installed or furnished under this Agreement shall be purchased subject to any chattel mortgage

or under a conditional sale, lease-purchase or other agreement by which an interest is retained by the seller or supplier. The Contractor shall warrant good and clear title to all materials, supplies, and equipment installed or incorporated in the Work and upon completion of all Work, shall deliver the same together with all improvements and appurtenances constructed or placed by Contractor to the County free from any claims, liens, or charges. Neither Contractor nor any person, firm, or corporation furnishing any material or labor for any Work shall have any right to a lien upon any improvement, appurtenance, component, or property of the County whatsoever. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any law permitting such persons to look to funds due to the Contractor in the hands of the County. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the Work when no formal contract is entered into for such materials.

SECTION 3. INSURANCE

3.01 INDEMNIFICATION. THE CONTRACTOR SHALL SAVE HARMLESS THE COUNTY, ITS OFFICIALS, EMPLOYEES AND REPRESENTATIVES FROM ALL DAMAGES, EXPENSES, SUITS, ACTIONS AND CLAIMS OF EVERY KIND AND CHARACTER WHATSOEVER WHICH THE COUNTY MAY SUFFER DIRECTLY OR INDIRECTLY AS A RESULT OF THE CONTRACTOR'S NON-PERFORMANCE OF THE CONTRACT, INCLUDING ANY DEGREE OF MIXED NEGLIGENCE OR FAULT OF THE COUNTY. CONTRACTOR SHALL ALSO SAVE HARMLESS AND INDEMNIFY THE COUNTY AND ALL ITS REPRESENTATIVES FROM ALL DAMAGES, EXPENSES, SUITS, ACTIONS AND CLAIMS OF EVERY KIND AND CHARACTER WHATSOEVER WHICH THE COUNTY MAY SUFFER DIRECTLY OR INDIRECTLY DUE TO ANY BANKRUPTCY, STATE OR FEDERAL TAX LEVIES OR LIENS, OTHER LEGAL PROCEEDINGS OR OTHER MATTERS, SIMILAR OR DISSIMILAR, AFFECTING THE CONTRACTOR, IN WHICH THE COUNTY MAY BECOME IN ANY WAY INVOLVED, WHETHER RELATED TO THE CONTRACT AND/OR THE CONTRACTOR'S PERFORMANCE OR NON-PERFORMANCE UNDER THE CONTRACT, INCLUDING ANY DEGREE OF MIXED NEGLIGENCE OR FAULT OF THE COUNTY.

3.02 Insurance. Prior to commencing any work, but no later than ten working days after award of contract, the Contractor shall submit or cause to be submitted any and all Certificate(s) of Insurance, showing that the Contractor has the required insurance, to the County's Representative. Failure to timely comply may cause this Contract to be rescinded and/or cancelled. Such insurance is to be provided at the sole cost of the Contractor. No Work shall be performed until all of the required insurance has been received and approved.

***NOTE: See Item "D" Workers' Compensation prior to award of Contract**

The Contractor shall be the "Named Insured" on ALL policies. At all times during the term of this contract, the Contractor shall maintain insurance coverage of the type and in the amounts which are not less than the minimum amounts shown. These requirements do not establish limits of the Contractor's liability. No policies shall be cancelled or lapsed on account of any partial occupancy or substantial completion.

All insurance coverage shall be written by companies holding a Certificate of Authority from the Texas State Board of Insurance, have a Best Financial rating of at least "A" or better and being otherwise acceptable to the County. In the event that coverage is not procurable, after diligent effort has been made to do so, from among the insurers licensed to transact and actually write the type and class of insurance in the State of Texas, the County may consider "Surplus Lines Insurance" pursuant to the Texas Insurance Code Ann. § 981.

ENDORSEMENTS

1. The County must be "Additional Insured" on the commercial general liability and business automobile liability (with Contractor's insurance policy as primary).

2. All policies shall waive all rights of subrogation against the County, its officers, employees and agents.

3. All policies shall provide that a thirty (30) day written notice shall be submitted to the County's Representative, in the event of cancellation or material change. If the coverage period shown on the Contractor's current certificate ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate with the County showing that coverage has been extended.

** All certificates must contain the Work description and all of the above endorsements.

MINIMUM REQUIREMENTS

Insurance Coverage	Limits of Liability
A. Commercial General Liability, occurrence form, including coverage for bodily injury, personal injury, and property damage, Independent Contractor's Liability, Premises and Operation, Products Liability, Products-Completed Operations, Contractual Liability, and, if applicable to the project, coverage for watercraft, blasting, collapse, explosions, blowout, cratering, underground damage, pollution, and asbestos	\$1,000,000 each occurrence \$2,000,000 aggregate
B. Business Automobile Liability, including hired and non-owned coverages	\$1,000,000 each occurrence
C. Builder's Risk (building construction only) all risk	100% of the dollar value of the Contract
D. Workers' Compensation	Statutory Limits

In regard to Workers' Compensation Coverage, the following special requirements shall apply:

1. Certificate of coverage ("certificate") – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the Work.

Duration of the Work – includes the time from the beginning of the Work on the project until the Contractor's Work on the project has been completed and accepted by the County.

Persons providing services on the project ("Subcontractor" Texas Labor Code in section 406.121) - includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent Contractors, Subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

2. The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the project, for the duration of the Work.
3. The Contractor must provide a certificate of coverage to the County prior to being awarded the Contract.
4. If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the County showing that coverage has been extended.
5. The Contractor shall obtain from each person providing services on a project, and provide to the County:
 - a. a certificate of coverage, prior to that person beginning Work on the project, so the County will have on file certificates of coverage showing coverage for all persons providing services on the project; and
 - b. no later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.
6. The Contractor shall retain all required certificates of coverage for the duration of the Work and for one year thereafter.

7. The Contractor shall notify the County in writing by certified mail or personal delivery, within 10 days after the Contractor knows or should know, of any change that materially affects the provision of coverage of any person providing services on the project.
8. The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage. (This notice must be printed with a title in at least 30-point bold type and text in at least 19 point normal type, and shall be in both English and Spanish and any other language common to the worker population.)

REQUIRED WORKERS COMPENSATION COVERAGE

"The law requires that each person working on this site or providing services related to this construction project must be covered by workers' compensation insurance. This includes persons providing, hauling, or delivering equipment or materials, or providing labor or transportation or other service related to the project, regardless of the identity of their employer or status as an employee."

"Call the Division of Workers' Compensation at 1-800-252-7031 or access the division's website at www.tdi.texas.gov/wc/indexwc.html to receive information on the legal requirement for coverage, to verify whether your employer has provided the required coverage, or to report an employer's failure to provide coverage."

9. The Contractor shall contractually require each person with whom it contracts to provide services on a project, to:
 - a. provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;
 - b. provide to the Contractor, prior to that person beginning Work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

- c. provide to the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
 - d. obtain from each other person with whom it contracts, and provide to the Contractor:
 - i. a certificate of coverage, prior to the other person beginning Work on the project; and
 - ii. a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
 - e. retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
 - f. notify the County in writing by certified mail or personal delivery, within 10 days after the person knows or should know, of any change that materially affects the provision of coverage of any person providing services on the project; and
 - g. contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificates of coverage to be provided to the person for whom they are providing services.
10. By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the County that all employees of the Contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.
11. The Contractor's failure to comply with any of these provisions is a breach of Contract by the Contractor which entitles the County to declare the Contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the County.

SECTION 4. REGULATORY REQUIREMENTS

4.01 LAWS TO BE OBSERVED. THE CONTRACTOR IS ASSUMED TO BE FAMILIAR WITH AND AT ALL TIMES SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE, COUNTY AND CITY LAWS, ORDINANCES AND REGULATIONS IN ANY MANNER AFFECTING THE CONDUCT OF THE WORK, AND SHALL INDEMNIFY AND SAVE HARMLESS THE COUNTY AND ITS REPRESENTATIVES AGAINST ANY CLAIM ARISING FROM THE VIOLATION OF, OR FAILURE TO COMPLY WITH ANY SUCH LAWS, ORDINANCES, OR REGULATIONS, BY THE CONTRACTOR OR ITS EMPLOYEES.

4.02 Permits and Licenses. The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the Work.

4.03 Barricades, Warning Lights and Signs on Projects Involving Public Roads. Unless provided otherwise in the Contract Documents, the Contractor is solely responsible for furnishing, erecting and maintaining, suitable barricades, warning signs, flares, barriers, cones, lights, flags, signals, flagmen and other traffic control devices as are or may be necessary to adequately protect the Work and shall warn, advise and safeguard the public over the entire project, including, but not limited to, sections of the project which the Contractor closes to traffic.

The Contractor's responsibility in this regard extends for the entire duration of the Work, from the start of construction until acceptance by the County. All barricades, signs and other types of devices necessary for traffic control and to protect the Work shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices".

4.04 Sanitary Provisions. The Contractor shall provide and maintain in a neat, sanitary condition, such accommodations for the use of its employees as may be necessary to comply with the requirements of any Federal, State, County or City laws, ordinances or regulations.

4.05 Safety and Health Standards. The Contractor shall observe and comply with all safety and health standards and to all legislation and amendments enacted for the safety and health of Contractor's employees. Such safety and health standards shall apply to all Subcontractors, and the Contractor shall be responsible for initiating, maintaining, supervising and inspecting safety programs, safety systems and safety precautions, including, but not limited to, trench safety requirements, in connection with the Work.

4.06 Environmental Protection. The Contractor shall be responsible for compliance with all applicable environmental protection requirements, codes, regulations, laws and ordinances.

The Contractor shall recognize the environmental requirements of the project. Disturbed areas shall be strictly limited to boundaries established by the County's Representative. Particular attention is drawn to the avoidance of any pollution of any "on-site" streams, sewers, wells or other water sources.

Contractor shall prevent erosion of soil and excess runoff of surface or subsurface water from the construction site during the construction period. To retain existing drainage patterns external to the construction site, the Contractor shall construct temporary ground cover as needed to control conditions. The Contractor shall legally dispose of all solid waste materials and other materials to be removed from the site by transporting to disposal areas that are approved by State and local authorities. No burning shall be permitted unless otherwise noted. All Work shall be performed in such a manner as may be required to avoid pollution of the air by dust or other contaminants. The Contractor shall control excessive noise at the job site.

4.07 Cultural Artifacts. The Contractor shall not remove or disturb, or cause or permit to be removed or disturbed, any historical, archaeological, architectural, or other cultural artifacts, relics, vestiges, remains, or objects of antiquity. In the event such items are discovered on the premises, the Contractor shall immediately notify the Representative, and the site and the material shall be protected by the Contractor from further disturbance until a professional examination of them can be made, or until clearance to proceed is authorized by the Representative.

4.08 Use of Explosives. When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use the utmost care not to endanger life or property. All explosives shall be stored in a secure manner and all such storage places shall be marked clearly "Dangerous", "Explosives" and shall be in the care of competent watchmen. The Contractor shall be solely responsible for damage caused by explosives.

4.09 Project Signs. When required, the Contractor shall provide, install and maintain a project sign at the construction site. The borders and block style letters will be black, while the sign background and other exposed surfaces shall be white. Inscriptions shall include the name of the project, County officials, County's Representative, and Contractors as shown on the Drawings.

4.10 Rest Room and Field Office. When required by the County's Representative, the Contractor shall provide and maintain at its own expense an office and a rest room for the exclusive use of the Representative and the Representative's staff for all projects over one hundred (100) calendar days in duration. The office will be

approximately 200 square feet in size, mounted on skids, wheels or other approved mobility with 7 feet minimum ceiling height and shall be of weather-tight construction. The inside walls of the office shall be lined with paneling or other material approved by the Representative, and the office shall have no fewer than six double-hung windows, a door with hasp for padlock and a floor a minimum of 8 inches above the ground covered in tile or other material approved by the Representative. The office shall have a closet at least 3 feet wide, 1-1/2 feet deep and 7 feet in height, a sloped top stand-up height table and stool, a desk, 3 chairs, and a lockable two-drawer legal size file cabinet. The Contractor shall also provide two racks for holding Drawings and an office sign 24" X 36", painted as directed by the Representative. All exterior openings shall be screened. The rest room and field office shall be complete and ready for use on or before the first day construction begins. The rest room and field office shall be placed at a location satisfactory to the Representative. The office shall be wired and furnished with electricity, shall be air-conditioned, heated and shall have WiFi and/or wireless internet service and contain a working telephone with a separate line and an outside bell for the exclusive use of the Representative and Representative's staff.

The Contractor and Subcontractors may maintain such office and storage facilities on the site as are necessary for the proper conduct of the work. These shall be located as to cause no interference to any Work to be performed on the site nor the County's operations. The Representative must approve of the locations.

These buildings, and the items furnished with the buildings, shall remain the Contractor's property, and all such temporary facilities shall be removed by the Contractor at the end of the project, leaving the site of the Work in the condition required by the Contract. No direct payment will be made for these structures or the furnishings.

SECTION 5. PROSECUTION OF THE WORK

5.01 Prosecution of Work. The Contractor shall notify the Representative at least twenty-four (24) hours before beginning Work. The Contractor shall start the Work at any part of the project designated by the Representative and shall prosecute the Work at as many different points as the Representative shall direct.

5.02 Construction Schedule. For all Work of one million to five million dollars, the Contractor will submit a detailed construction schedule within seven days of Notice to Proceed. The schedule will be a bar type schedule and shall be of sufficient detail to show construction sequence, proposed start dates and estimated completion dates for major parts of the Work. Projects over five million dollars require the Contractor to provide a computer based critical path method schedule to the satisfaction of the Representative within thirty (30) days from Notice to Proceed.

5.03 Time of Completion. Time is of the essence of this Contract. If the Contractor fails to acceptably complete the Contractor's undertaking to the County within the time specified in its Bid and Contract, the County will be damaged. The exact amount of damage is, and will be, difficult of exact ascertainment. Such damages shall be at the rate, or the amount hereinafter fixed. The Contractor specially binds and obligates himself to pay such damages to the County on demand, or at the County's option the County may withhold the amount thereof from any sums due the Contractor under this Contract.

The County's Representative shall record on forms furnished by the County the time worked each calendar day, if any, by the Contractor. When requested by the County's Representative, such records or reports shall be signed by the Contractor or the Contractor's Representative and the Contractor shall be entitled to a copy thereof. Failure of the Contractor to sign or to receive a copy shall not affect the result of the findings made in such reports. One copy of such report shall be filed daily with the County's Representative. Work shall begin on the date fixed in the Notice to Proceed. The Work will be completed and ready for Final Payment in accordance with paragraph 6.04 of the Standard Agreement within 245 calendar days after the date when the Contract Time commences to run. The County will suffer financial loss if the Work is not completed within the time specified herein, plus any extension thereof allowed in accordance with paragraph 5.06 of the Standard Agreement. The County and the Contractor recognize the delays, expense, and difficulties involved in proving, in a legal proceeding, the actual loss suffered by the County if the Work is not complete on time. Accordingly, instead of requiring any such proof, the County and the Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall pay the County One thousand dollars and no cents (\$1,000.00) for each day that expires after the time specified herein for completion until the Work is complete. In case full payment for the Work shall have been made, the County shall have the right to recover from the Contractor and the Contractor's Surety the amount of such liquidated damages as determined under this Contract.

If the Work is delayed or impeded at any time by (1) the act or omissions of the County or the Representative; (2) changes in the work; (3) other causes not reasonably foreseeable by the parties at the time of the execution of the contract which are beyond the control and without the fault or negligence of the Contractor, including without limitation: acts of God, fire, epidemic, quarantine, blockade, war, strikes, or embargoes; or (4) any other cause which the Contractor and Representative agree justifies an extension of Contract Time, then the Contractor's sole and exclusive remedy is an extension of Contract Time. To obtain the extension of Contract Time, the Contractor must promptly notify the Representative within 10 days of the onset of the delay. Upon receipt of notice, the Representative shall ascertain the facts and the cause and extent of the delay. The Representative has the authority to grant an extension of Contract Time under this paragraph.

COMPUTATION OF CONTRACT TIME – When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last date of any such period falls on a Saturday and Sunday or on a day made a legal holiday by Commissioners Court, such day will be omitted from the computation.

The specified number of calendar days in which the Work is to be completed pursuant to the Contract are consecutive Gregorian calendar days inclusive of Saturdays, Sundays, and all legal holidays. A calendar day of twenty-four (24) hours measured from midnight to the next midnight shall constitute a day.

Contract Time includes 65 calendar days to accommodate inclement weather. If the number of inclement weather days exceeds 110% of the above-mentioned number of calendar days to accommodate inclement weather, the Contractor may make a written application to the Representative for, and receive, an extension of the Contract Time, for such number of days that the inclement weather days exceeds 100% of the above mentioned number of calendar days to accommodate inclement weather. After receipt of such application, the Representative shall make a determination as to which days, if any, during the Contract Time are inclement weather days, and the Representative's decision shall be final. The Contractor shall be entitled to an extension of the Contract Time equal to such excess as determined by the Representative. The term "inclement weather day", as used herein, means a day in which weather or wet soil does not permit the performance of the Work for a continuous period of not less than seven hours between the hours of 7 a.m. and 6 p.m.

5.04 Abandonment of Work or Default of Contractor. If the Contractor fails to begin the Work within the time specified; or fails to make deliveries or to provide sufficient workmen and equipment or sufficient materials to insure the prompt completion; or performs the Contract unsuitably; or neglects or refuses to remove materials or perform anew such Work as shall have been rejected as defective or unsuitable; or discontinues the prosecution of the Work; or becomes insolvent or is declared bankrupt; or commits any act of bankruptcy or insolvency; or allows any final judgment to stand against the Contractor unsatisfied for a period of forty-eight (48) hours or longer; or makes an assignment for the benefit of creditors; or fails to comply with any of the conditions of the Contract to such an extent that the Contract is forfeited or abandoned by the Contractor, or declared abandoned or suspended by the County; or if the Contractor for any other cause whatsoever shall not carry on the Work or perform the Contract in an acceptable manner, then and in that event, the Surety on the Contractor's Performance Bond shall have the right and privilege, within seven (7) calendar days after the date of notice of such action from the County, to assume control of the Contract and all Work thereunder and to sublet or complete the Work in strict conformity with the provisions of said Contract. Failure of the Surety to do so within said seven (7) calendar days will result in an immediate forfeiture of all right to thereafter assume control of the Contract and the Work

thereunder, in which event the County shall have the right to take the prosecution of the Work out of the hands of the Contractor and to appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable, and enter into an Agreement for the completion of the Contract according to the terms and provisions thereof or use such other methods as in the Representative's opinion may be required or desirable for the completion of the Contract in an acceptable manner. All costs and charges incurred by the County, together with the costs of completing the Work, shall be deducted from any money due or which may become due said Contractor. In the event the cost and expense so incurred by the County is less than the sum which would have been payable under the Contract if it had been completed by said Contractor, then the said Contractor and/or Surety shall be entitled to receive the difference. In the event such cost shall exceed the amount which would have been payable under the Contract, then the Contractor and Surety shall be liable and shall pay to the County the amount of said excess.

5.05 Termination for Convenience of the County. The County may terminate this Agreement at any time by notice in writing to the Contractor. Upon receipt of such notice, the Contractor shall stop all work. Within ninety (90) days after receipt of notice of termination, the Contractor shall submit a statement, showing in detail the Work performed under this Agreement to the date of termination. The County shall then pay the Contractor that proportion of the Contract price which the Work actually performed under this Agreement bears to the total Work called for under this Agreement, less such payments as have been previously made. The County suggests that the Contractor have a similar termination provision in all its contracts inasmuch as the County will not compensate the Contractor for loss of profits or any other damage resulting from such termination.

5.06 Change Orders. The County may make changes in the scope of Work required to be performed by the Contractor under the Agreement via Change Orders without relieving or releasing the Contractor from any obligations under the Agreement or any guarantee given by the Contractor pursuant to the Contract Documents, and without affecting the validity of the Bonds, and without relieving or releasing the Surety of said Bonds. All such Work shall be performed under the terms of the original Contract unless a Change Order expressly provides otherwise.

Except for the purpose of affording protection against any emergency endangering health, life, limb or property, the Contractor shall make no change in the Work, materials used, the specified manner of constructing and/or installing the improvements, nor supply additional labor, services, or materials beyond that actually required for the execution of the Contract as originally agreed unless pursuant to a written Change Order authorizing the Contractor to proceed with the change. No claim for additional compensation will be valid unless pursuant to a written Change Order.

The net value of all changes does not increase the original total amount of the Agreement by more than twenty-five percent (25%) or decrease the original total amount by more than eighteen percent (18%). In the case of a unit price contract, unit prices specified in the Contract shall govern the Change Order.

Each Change Order shall include:

1. A detailed description of the change in the work.
2. The Contractor's proposal (if any).
3. A definite statement as to the resulting change in the Contractor's compensation and/or Contract Time.
4. The statement that all work involved in the Change Order shall be performed in accordance with the Contract except as modified by the Change Order.

5.07 Subcontracting. Within ten days after Contract award, the Contractor is required to furnish a list of Subcontractors proposed for principal portions of the Work. Subcontractors will not be replaced by the Contractor without notice to the County.

Nothing contained in the Contract Documents will create any contractual relation between the County or the Representative and any Subcontractor.

The Contractor shall promptly make payments to all persons supplying labor and materials or furnishing any equipment in the execution of the Contract. Neither the County nor the Representative has any obligation to pay, or see to the payment of, any monies to any Subcontractor except as may otherwise be required by law.

No Subcontractor shall, under any circumstances, relieve the Contractor of the Contractor's liabilities and obligations under this Contract, should such Subcontractor fail to perform the Work undertaken by it in a satisfactory manner. The Contractor shall be fully responsible to the County for the acts and omissions of Subcontractors and of persons either directly or indirectly employed by them.

If County notifies Contractor that this Agreement will be funded in whole or in part by federal funds, the Contractor shall not execute any agreement with any Subcontractor or permit any Subcontractor to perform any work included in this contract until Contractor has verified the Subcontractor as eligible to participate in federally funded contracts.

5.08 Character of Workmen and Equipment. Any foreman or workman employed by the Contractor or by any Subcontractor who, in the opinion of the County's Representative, does not perform their Work in a proper and skillful manner or is disrespectful, intemperate, disorderly or otherwise objectionable, shall at the written request of the Representative, be forthwith removed from the job site by the

Contractor or any Subcontractor employing such foreman or workman and shall not be employed again on any portion of the Work without the prior written consent of the Representative. Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient machinery, equipment or force for the proper prosecution of the Work, the Representative may withhold all estimates which are, or may become, due, or may suspend the Work until such workmen, engaged on special Work or skilled Work, shall be replaced by persons having sufficient experience in such Work to properly and satisfactorily perform it and operate the equipment involved, and shall perform the Work in the manner prescribed in these Specifications.

5.09 PROTECTION AGAINST CLAIMS OF SUBCONTRACTORS, LABORERS, MATERIALMEN AND FURNISHERS OF MACHINERY, EQUIPMENT AND SUPPLIES. THE CONTRACTOR SHALL INDEMNIFY AND SAVE THE COUNTY HARMLESS FROM ALL CLAIMS GROWING OUT OF THE LAWFUL DEMANDS OF SUBCONTRACTORS, LABORERS, WORKMEN, MECHANICS, MATERIALMEN AND FURNISHERS OF MACHINERY AND PARTS THEREOF, EQUIPMENT, POWER TOOLS AND ALL SUPPLIES, INCLUDING COMMISSARY, INCURRED IN THE FURTHERANCE OF THE PERFORMANCE OF THE CONTRACT. WHEN SO DESIRED BY THE COUNTY, THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE THAT ALL OBLIGATIONS OF THE NATURE HEREIN ABOVE DESIGNATED HAVE BEEN PAID, DISCHARGED OR WAIVED.

5.10 Authority of Representative. The Work shall be done under the direct observation of the Representative and to the Representative's satisfaction. The Representative shall decide any and all questions which may arise as to the quality or acceptability of materials furnished, Work performed, and rate of progress of the Work, and shall decide all questions which may arise as to the interpretation of the Drawings and Specifications and all questions as to the acceptable fulfillment of the Contract on the part of the Contractor. The Representative's decisions under this provision shall be final and binding on both parties hereto.

5.11 Cooperation of Contractor. The Contractor shall give the Work constant attention to facilitate the progress thereof and shall cooperate with the Representative in every way possible. The Contractor shall have at all times, regardless of how much of the Work may be sublet, a competent and reliable English-speaking superintendent on the job site authorized to receive orders and to act for the Contractor.

The Contractor shall give the Representative full opportunity to inspect the Work at all stages, and where there has been any Work stoppages the Contractor shall give the Representative at least twenty-four (24) hours notice before resuming operations. Where any gas, water, or other utility installations will be affected by the

Work to be carried on by the Contractor, the Contractor must provide ample notice to the owners, operators or persons in charge so that the prosecution of the Work under this Contract is not delayed.

5.12 Contractor's Drawings. Supplementary Drawings, shop details, working Drawings and other data required by Contract Documents shall be furnished by the Contractor but shall not be used prior to approval. Authorized alterations will be endorsed by the Representative on approved Drawings or shown on supplementary sheets. Shop Drawings for steel structures shall consist of shop details, erection and other working Drawings showing details, dimensions, sizes of members and other information necessary for the complete fabrication and erection of the metal work. Working Drawings of concrete structures shall consist of such detailed Drawings as may reasonably be required for the successful prosecution of the Work and which are not included in the Drawings furnished by the Representative. It is expressly understood that the approval of the Representative of the Contractor's shop working Drawings is general, and such approval will not relieve the Contractor of any responsibility whatsoever. The Contractor shall furnish the Representative with such print copies of the working Drawings as may be required for approval and for construction purposes. The Contract price shall include the cost of furnishing all Shop Drawings, and the Contractor will be allowed no extra compensation for such Drawings.

5.13 Record Drawings. The Contractor shall maintain in a safe place at the site one i copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications in good order and annotated to show all changes made during construction. These Record documents, together with all approved Samples and a counterpart of all approved Shop Drawings, will be available to Representative for reference. Upon completion of the Work, these Record documents, along with all Samples and Shop Drawings, must be delivered to the County's Representative.

5.14 Reference Points. The County shall provide engineering surveys to establish reference points for construction which in the Representative's judgment are necessary to enable the Contractor to proceed with the Work. The Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without prior written approval of the County. The Contractor shall report to the Representative whenever any reference point is lost or destroyed or requires relocations because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

5.15 Materials and Workmanship. The Contractor shall submit Samples or specimens of the materials to be furnished or used in the Work as the Representative may require. All materials must be of specified quality and equal to approved Samples,

and shall be stored so as to ensure the preservation of their quality and fitness for the Work.

All materials not conforming to the Specifications shall be considered defective and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the Work, unless otherwise permitted by the Representative. No rejected materials, the defects of which have been subsequently corrected, shall be used until approval has been given by the Representative. All Work which has been rejected shall be remedied or removed and replaced in an acceptable manner by the Contractor at the Contractor's own expense, and no compensation shall be allowed for such removal or replacement. Upon failure of the Contractor to forthwith comply with any order of the Representative made under the provisions of this article, the Representative shall have the authority to remove and replace defective material or Work and to deduct the cost of removal and replacement from any monies due, or to become due, the Contractor.

5.16 Patented Devices, Materials and Processes. If the Contractor uses any design, material, or process covered by letters, patent or copyright, the Contractor shall provide for such use with the patentee or owner. **THE CONTRACTOR SHALL INDEMNIFY AND SAVE HARMLESS THE COUNTY FROM ANY AND ALL CLAIMS FOR INFRINGEMENT.**

5.17 Inspection. The Representative shall be authorized to inspect all Work in progress, all Work completed, and all materials furnished. The Representative shall not be authorized to revoke, alter, enlarge, relax, or release any requirements of these Specifications. The Contractor shall also furnish the Representative a statement from the Subcontractor that the Subcontractor understands the Drawings and Specifications and is properly qualified to perform such Work. No Subcontract will in any way affect the terms of the Contract between the County and the Contractor or relieve the Contractor of any of its obligations thereunder.

The Representative shall at all times have access to all parts of the shop where material under this Contract is being manufactured. Material that does not conform to the Specifications, accepted through oversight or otherwise, may be rejected at any stage of the Work. The Contractor shall remove and rebuild at the Contractor's own expense any part of the project that has been improperly executed, even if it has been included in the monthly estimates. If the Contractor refuses or neglects to correct any defective work, it may be corrected by the County, at the Contractor's expense.

Whenever the Contractor is permitted or directed to do night work, or to vary the period during which the Work is carried on each day, the Contractor shall give the Representative due notice so that inspections may be performed. Such Work shall be done without extra compensation. The Contractor will furnish the Representative a schedule for this night work.

Should the Representative require it, the Contractor shall at any time during the construction of Work, make openings for inspection through any part of said Work to such extent as the Representative may direct, and the Contractor shall make the same good again to the satisfaction of the Representative. Should the Work, in the opinion of the Representative, be found to be faulty in any respect, all such faulty Work shall be replaced by the Contractor.

5.18 Material Testing. The County will assign a testing laboratory and will pay for testing and inspection directly, unless otherwise noted in the Specifications. Final testing and inspection may be made after the delivery of materials to the project site. Structural materials may be tested and inspected at points of origin. Should materials or construction not be in accordance with the Specifications when first tested, additional testing shall be required. If the materials or construction meets Specifications and passes the retest, the cost of the retest will be at the County's expense. If the retest does not meet Specifications and fails, the cost of the retest and all subsequent retests shall be at the Contractor's expense. Testing and retesting may be made at any time during the progress of the Work. It shall be the responsibility of the Contractor to notify the Representative in advance as to the time of individual concrete placements. This is necessary in order to schedule the laboratory without unduly delaying construction.

5.19 Contractor's Responsibility for Work. Until the acceptance of the Work by the Representative as evidenced in writing, the Work shall be under the charge and care of the Contractor. The Contractor shall take every necessary precaution against injury or damage to any part thereof by the action of the elements or from any cause, whether arising from the execution or non-execution of the Work. The Contractor shall rebuild, repair, restore and make good at the Contractor's own expense all injuries or damages to any portion of the Work before its completion and acceptance. The Contractor shall keep the premises free from accumulation of waste materials, rubbish, and other debris resulting from the Work. At the completion of the Work, the Contractor shall leave the site clean and ready for its use by the County.

5.20 Preservation and Restoration of Property. The Contractor shall be responsible for the preservation of the County's property adjacent to the project. When or where any direct or indirect damage is done to the County's, or adjacent, property by or on account of any act, omission, neglect or misconduct in the performance of the Work or in consequence of the non-performance thereof on the part of the Contractor, the Contractor shall restore, at the Contractor's own expense, such property to a condition equal to that existing before such damage was done by repairing, rebuilding or otherwise restoring same, or the Contractor will make good such damage in a manner acceptable to the Representative.

5.21 Emergencies. In emergencies affecting the safety or protection of persons, or the Work, or Property at the site, or adjacent thereto, the Contractor, without special instruction or authorization from the County or the Representative, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Representative prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Document have been caused thereby.

5.22 Public Utility Obstruction. When public utilities, such as poles, pipes, conduits, etc. must either be removed or adjusted to a new location on the site to make way for new construction, the Contractor shall cooperate with the public utility making the changes and shall use every precaution to protect their property.

5.23 Guarantee. The Contractor agrees to replace, without cost to the County, any Work found to be improper or defective and to make good all damage or other Work caused by such replacement. The guarantee period for the Work is one year from substantial completion of the project. Additional guarantees for specific items may also be required by the Specifications. The guarantees must be presented to, and approved by, the Representative before project acceptance and Final Payment is made.

The Contractor will supply the County with copies of all guarantees and warranties, which have been made to the Contractor by suppliers or Subcontractors, with an assignment of these guarantees and warranties to the County. Assignments will not relieve the Contractor of the Contractor's responsibility in the case of a supplier's or Subcontractor's failure to fulfill guarantee or warranty provisions. If the Contractor is prevented for any reason from making any such assignment to the County, the Contractor hereby gives the County permission to enforce any and all non-assignable guarantees and warranties in the Contractor's name, and the Contractor shall pass on to the County any benefits derived therein.

Neither final completion of the project, nor any provision in the Contract Documents relieves the Contractor of responsibility for faulty materials or workmanship during guarantee periods.

5.24 Substantial Completion. When the Contractor considers the entire Work ready for its intended use, the Contractor shall notify the County in writing that the entire Work is substantially complete (except for items specifically listed as incomplete) and request that the Representative issue a certificate of Substantial Completion. Within a reasonable time thereafter, the Parties to the Contract shall make an inspection of the Work to determine the status of completion. If the Representative does not consider the Work substantially complete, he will notify the Contractor in writing giving the reasons therefore. If the Representative considers the Work substantially complete, he will prepare a certificate of Substantial Completion which shall fix the

date of Substantial Completion. There shall be attached to the certificate, a punch list of items to be completed or corrected before Final Payment. The Substantial Completion certificate will allow a reasonable period for the Contractor to complete the punch list items. Upon satisfactory completion of all punch list items the Contractor may apply for Final Payment.

5.25 Partial Utilization. Acceptance and use by the County, at the County's option, of any substantially completed part of the Work which (a) has specifically been identified in the Contract Documents, or (b) the County and the Contractor agree constitutes a separately functioning and usable part of the Work that can be used by the County for its intended purpose without significant interference with the Contractor's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work.

SECTION 6. PAYMENT

6.01 Schedule of Values. Before the first Partial Payment the Contractor shall submit to the Representative a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Representative may require. The schedule must be prepared in such a manner that each major item of Work and each subcontracted item of Work is shown as a single line item. This schedule, unless objected to by the Representative, shall be used as a basis for reviewing the Contractor's payments.

6.02 Partial Payments. At the earliest possible date after the first day of each calendar month, the Representative will make a current estimate in writing of the materials in-place complete, and the amount of Work performed through the last day of the preceding calendar month, and the value thereof based on the Contract price, the value being hereinafter called the "Current Value of the Work". The Representative shall also, unless otherwise provided in the Contract Documents, determine the reasonable invoice cost of all materials and equipment for subsequent incorporation into the Work that have been delivered and suitably stored at the site (or, with advance approval by the Representative, stored off-site at an agreed location) but which remain unincorporated into the Work, such reasonable cost being hereinafter called the "Current Value of Stored Materials and Equipment". The Representative shall determine the number of elapsed calendar days during the performance of the Work, and the amount of any accrued liquidated damages. Within thirty (30) days after audit and approval of the Representative's determinations for each month by the County Auditor, the County shall pay to the Contractor an amount equal to 90% of both the approved Current Value of the Work and the approved Current Value of Stored Materials and Equipment, less the amount of all prior payments hereunder to the Contractor and less the amount of any accrued liquidated damages. Stored materials and equipment for which reimbursement has been received by the Contractor may not be removed from its place of storage without the

Representative's permission except for incorporation into the Work. The value of materials for which payment has been made while stored shall not be included in the Current Value of the Work. The 10% withheld from partial payments will be payable to the Contractor, subject to any adjustments made in accordance with this Agreement, at the time of final payment.

6.03 Adjusting Payment. If Change Orders diminish the amount of Work, any resulting decrease in the amount to be paid the Contractor pursuant to the Contract will not constitute the basis for a claim. If Change Orders increase the amount of Work, and the Work can be classified under Contract Documents, the Contract sum will be increased according to the Work actually done at established unit prices.

If the Representative deems it not expedient to require Contractor to correct portions of the Work which are not in conformity with the Contract Documents, Representative may reach a written agreement with Contractor to reduce the amount due to the Contractor for the nonconforming portions of the Work rather than requiring correction thereof.

6.04 Acceptance and Final Payment. The Representative shall, as soon as practicable after the completion of this Contract, make a Final Estimate of the amount due the Contractor under the provisions of the Contract and submit same to the Commissioners Court. Within thirty (30) days after approval by the Commissioners Court and the County Auditor, the County shall pay the Contractor the amount of the estimate or Final Estimate after deducting therefrom all previous payments and all amounts to be retained under the provisions of this Contract. All prior Partial Estimates and Payments shall be subject to correction in the Final Estimate and Payment. No estimate or payment except the Final Payment shall be evidence of performance by the Contractor. No payment by the County shall be construed to be an acceptance of any defective Work or improper materials, or a release from any claim for damages. The payment of the final amount due under the Contract, and the adjustment and payment of the bill rendered for any Work done in accordance with any alterations of the Contract by a Change Order, shall release the County and the Representative from any and all claims or liability on account of Work performed under the Contract or alterations thereof. The Contractor will examine the Final Estimate and if correct will certify under oath to the payment by the Contractor of all claims against the Contractor for labor, materials, and supplies furnished the Contractor by all persons and firms in the performance of the Contract.

6.05 Auditor's Certification of Funds. The laws governing the awarding of Contracts by the County require the approval of the County Auditor and the County Auditor certify that funds are, or will be, available for the payment of the obligations created thereunder before such Contracts become effective. Despite any provisions in the Specifications, the Drawings or the Contract to the contrary, no change or addition of any character in the Specifications, the Drawings or the Contract which will increase

the obligations of the County, or the amount to be paid by the County shall ever be binding on the County unless and until such changes or additions have been submitted to the County Auditor and the County Auditor certifies that funds are, or will be, available for the payment of such obligation.

GALVESTON COUNTY

Project Manual for

Mental Health Extended Observation Unit

1207 S. Oak St.

La Marque, TX 77568

Huitt-Zollars Project No. R316595.02

January 12, 2024



SECTION 00 01 07.01
SEALS PAGE - ARCHITECTURE

The specification sections listed below were prepared by or under the direct supervision of the Architect:

Huitt-Zollars, Inc.
1001 Fannin St. Suite 4040
Houston, TX 77002

Architect: Joel Colwell



A handwritten signature in black ink, appearing to read 'Joel Colwell', written in a cursive style.

DIVISION 01

- 01 10 00 Summary
- 01 20 00 Price and Payment Procedures
- 01 25 00 Substitution Procedures
- 01 26 00 Contract Modification Procedures
- 01 30 00 Administrative Requirements
- 01 40 00 Quality Requirements
- 01 42 16 Definitions
- 01 50 00 Temporary Facilities and Controls
- 01 60 00 Product Requirements
- 01 70 00 Execution and Closeout Requirements
- 01 73 29 Cutting and Patching
- 01 78 00 Closeout Submittals
- 01 79 00 Demonstration and Training

DIVISION 02 – EXISTING CONDITIONS

- 02 41 19 Selective Demolition

DIVISION 03 - CONCRETE

- 03 54 00 Cast Underlayment

DIVISION 04 - MASONRY

- 04 01 00 Maintenance of Masonry
- 04 20 00 Unit Masonry

DIVISION 05 - METALS

05 05 53 Security Metal Fasteners
05 50 00 Metal Fabrications
05 51 33 Metal Ladders
05 52 13 Pipe and Tube Railings
05 73 16 Wire Rope Decorative Metal Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00 Rough Carpentry
06 20 00 Finish Carpentry
06 41 00 Architectural Wood Casework
06 61 16 Solid Surfacing Fabrications

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 19 00 Water Repellants
07 21 00 Thermal Insulation
07 25 00 Weather Barriers
07 41 13 Metal Roof Panels
07 42 13.23 Metal Composite Material Wall Panels
07 46 46 Fiber-Cement Siding
07 54 00 Thermoplastic Membrane Roofing
07 62 00 Sheet Metal Flashing and Trim
07 71 00 Roof Specialties
07 72 00 Roof Accessories
07 84 00 Firestopping
07 92 00 Joint Sealants
07 95 13 Expansion Joint Cover Assemblies

DIVISION 08 - OPENINGS

08 11 13 Hollow Metal Doors and Frames
08 14 23.23 Thermoplastic Clad Wood Doors
08 31 00 Access Doors and Panels
08 34 00 Special Function Doors
08 42 43 Intensive Care Unit / Critical Care Unit Entrances
08 43 13 Aluminum-Framed Storefronts
08 56 53 Security Windows
08 71 13 Power Door Operators
08 80 00 Glazing
08 87 23 Safety and Security Films

DIVISION 09 - FINISHES

09 05 61 Common Work Results for Flooring Preparation
09 21 16 Gypsum Board Assemblies

09 24 00	Cement Plastering
09 30 00	Tiling
09 51 00	Acoustical Ceilings
09 54 23	Linear Metal Ceilings
09 65 00	Resilient Flooring
09 72 00	Wall Coverings
09 72 16.16	Rigid Sheet Wall Coverings
09 91 13	Exterior Painting
09 91 23	Interior Painting
09 96 00	High-Performance Coatings

DIVISION 10 - SPECIALTIES

10 11 00	Visual Display Units
10 22 19	Demountable Partitions
10 26 00	Wall and Door Protection
10 28 00	Toilet, Bath, and Laundry Accessories
10 44 00	Fire Protection Specialties
10 51 13	Metal Lockers
10 51 23	Plastic-Laminate-Clad Lockers
10 73 26	Walkway Coverings

DIVISION 11 - EQUIPMENT

11 05 00	Common Work Results for Equipment
11 19 19	Surface Padding System
11 30 13	Residential Appliances

DIVISION 12 - FURNISHINGS

12 21 13	Horizontal Louver Blinds
12 24 00	Window Shades
12 36 00	Countertops
12 48 13	Entrance Floor Mats and Frames

END OF DOCUMENT

SECTION 00 01 07.02
SEALS PAGE - CIVIL

The specification sections listed below were prepared by or under the direct supervision of the Civil

Engineer:

Dally Associates
9800 Richmond Avenue, Suite 460
Houston, TX 77042

DIVISION 02 – EXISTING CONDITIONS

02 41 17 Site Demolition

DIVISION 31 – EARTHWORK

31 00 01 Site Earthwork
31 11 00 Clearing and Grubbing
31 23 00 Grading Excavation and Fill
31 23 00 Erosion and Sedimentation Control

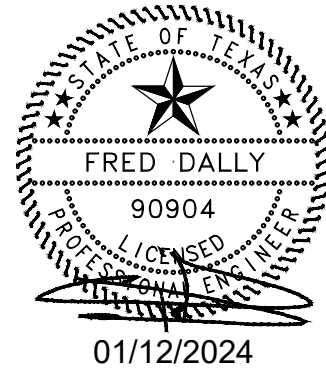
DIVISION 32 – EXTERIOR IMPROVEMENTS

32 13 13 Portland Cement Concrete Paving
32 13 19 Concrete Pavement Joints
32 16 13 Concrete Curbs and Cub and Gutter

DIVISION 33 - UTILITIES

33 05 16 Utility Structures
33 05 28 Trenching and Backfill for Utilities
33 05 16 Storm Sewage Systems

END OF DOCUMENT



SECTION 00 01 07.03
SEALS PAGE - STRUCTURAL

The specification sections listed below were prepared by or under the direct supervision of the Structural Engineer:

Dally + Associates, Inc.
9800 Richmond Avenue, Suite 460
Houston, TX 77042



DIVISION 03 – CONCRETE
03 05 80 UNDER-SLAB VAPOR BARRIER/RETARDER

DIVISION 03 – CONCRETE
03 10 00 CONCRETE FORMING AND ACCESSORIES

DIVISION 03 – CONCRETE
03 20 00 CONCRETE REINFORCING

DIVISION 03 – CONCRETE
03 30 00 CAST-IN-PLACE CONCRETE

DIVISION 05 - METALS
05 12 00 STRUCTURAL STEEL FRAMING

DIVISION 05 - METALS
05 31 23 STEEL ROOF DECKING

DIVISION 05 - METALS
05 40 00 COLD-FORMED METAL FRAMING

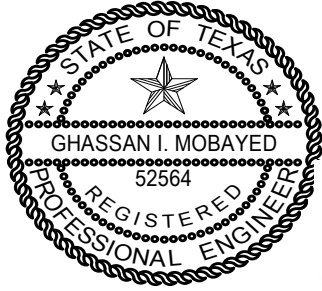
DIVISION 31 - EARTHWORK
31 63 29 DRILLED CONCRETE PIERS AND SHAFTS

END OF DOCUMENT

SECTION 00 01 07.04
SEALS PAGE - PLUMBING

The specification sections listed below were prepared by or under the direct supervision of the Plumbing

Engineer: Ghassan Mobayed



A handwritten signature in black ink, appearing to read "G. Mobayed", positioned to the right of the professional seal.

E&C Engineers & Consultants, Inc.
Texas Firm Registration No. F-003068

E&C Engineers and Consultants, Inc.
Suite 650
1010 Lamar St.
Houston, Texas 77002
Texas Firm Registration No: F-003068

DIVISION 20 – COMMON FIRE SUPPRESSION, PLUMBING and HVAC REQUIREMENTS

- 20 05 13 - Motors
- 20 05 29 - Support and Sleeves
- 20 05 53 - Piping and Equipment Identification
- 20 07 19 - Piping Insulation

DIVISION 21 – FIRE PROTECTION

- 21 10 13 - Wet Standpipe and Sprinkler Systems

DIVISION 22 – PLUMBING

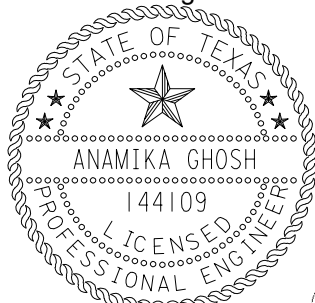
- 22 10 00 - Plumbing Piping
- 22 10 30 - Plumbing Specialties
- 22 20 23 - Natural Gas Piping
- 22 33 33 - Electric Domestic Water Heaters
- 22 40 00 - Plumbing Fixtures

END OF DOCUMENT

SECTION 00 01 07.05
SEALS PAGE - MECHANICAL

The specification sections listed below were prepared by or under the direct supervision of the

Mechanical Engineer: Anamika Ghosh



E&C Engineers & Consultants Inc.
Texas Firm Registration No: F-003068

A handwritten signature in black ink, appearing to read "Anamika Ghosh".

Anamika Ghosh
2024.01.11
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E&C Engineers and Consultants, Inc.
Suite 650
1010 Lamar St.
Houston, Texas 77002
Texas Firm Registration No: F-003068

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

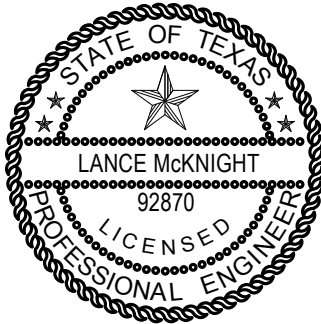
- 23 00 00 - Basic Mechanical Requirements
- 23 05 13 - Motors
- 23 05 16 - Expansion Compensation
- 23 05 29 - Sleeves, Flashing, Supports, and Anchors
- 23 05 48 - Vibration Isolation
- 23 05 53 - Mechanical Identification
- 23 05 93 - Testing, Adjusting and Balancing
- 23 05 94 - System Preparation for Testing, Adjusting, and Balancing
- 23 07 13 - Ductwork Insulation
- 23 07 16 - Equipment Insulation
- 23 07 19 - Piping Insulation
- 23 09 23 - Building Control and Automation (BCAS)
- 23 20 10 - Piping, Valves and Fittings
- 23 29 23 - Variable Frequency Drives
- 23 31 00 - Ductwork
- 23 33 00 - Ductwork Accessories
- 23 34 16 - Fans
- 23 37 00 - Air Outlets and Inlets
- 23 62 13 - Air-Cooled Split-System Air Conditioning Units
- 23 63 13 - Variable Refrigerant Volume DX Systems


END OF DOCUMENT

SECTION 00 01 07.06
SEALS PAGE - ELECTRICAL

The specification sections listed below were prepared by or under the direct supervision of the Electrical

Engineer: Lance McKnight



 Lance McKnight
2024.01.11
11:04:07-06'00'

E&C Engineers and Consultants, Inc.
Suite 650
1010 Lamar St.
Houston, Texas 77002
Texas Firm Registration No: F-003068

DIVISION 26 – ELECTRICAL

26 00 01 - Electrical General Provisions
26 01 25 - Electrical Testing
26 05 01 – Electrical Basic Materials and Methods
26 05 19 - Low Voltage Conductors and Cables
26 05 26 - Grounding and Bonding for Electrical Systems
26 05 33 - Electrical Raceways
26 05 34 - Electrical Boxes
26 05 53 - Identification for Electrical Systems
26 05 73 - Short Circuit Analysis/Fault Study
26 24 16 - Panelboards
26 27 01 - Electrical Service Entrance
26 27 26 - Wiring Devices
26 32 13 – Standby Generator Sets
26 36 34 – Automatic Transfer/Bypass-Isolation Switches
26 41 13 - Lightning Protection for Structures
26 43 13 - Surge Protective Devices
26 51 00 - Interior Lighting
26 56 00 - Exterior Lighting

283103 - Addressable Fire Alarm System

END OF DOCUMENT

SECTION 00 01 07.08
SEALS PAGE - TECHNOLOGY AND SECURITY

The specification sections listed below were prepared by or under the direct supervision of the
Technology and Security Consultant

ATLAS CONSULTING
2339 Commerce Street Suite 118,
Houston, Texas, 77002



DIVISION 27 – COMMUNICATIONS

- 27 00 10 General Requirements for Communications
- 27 05 33 Pathways for Communication Systems
- 27 10 00 Structured Cabling System
- 27 41 00 Integrated Audiovisual Systems
- 27 51 23 Intercommunications System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

- 28 00 10 General Requirements for Security Systems
- 28 05 33 Pathways for Security Systems
- 28 10 00 Access Control
- 28 20 00 Video Surveillance System

END OF DOCUMENT

SECTION 00 01 07.09
SEALS PAGE - LANDSCAPE

The specification sections listed below were prepared by or under the direct supervision of the Landscape

Architect: Jeffrey B. Holba

HUITT-ZOLLARS

5430 LBJ Freeway Suite 1500
Dallas, Tx 75240

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 90 00 Planting
32 92 23 Sodding



Irrigator: Harrison K. Flores

HUITT-ZOLLARS

5430 LBJ Freeway Suite 1500
Dallas, Tx 75240

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 80 00 Irrigation



END OF DOCUMENT

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00 01 07.02	Seals Page - Civil
00 01 07.03	Seals Page - Structural
00 01 07.04	Seals Page - Plumbing
00 01 07.05	Seals Page - Mechanical
00 01 07.06	Seals Page - Electrical
00 01 07.07	Seals Page - Fire Protection
00 01 07.08	Seals Page - Technology And Security
00 01 07.09	Seals Page - Landscape
00 01 10	Table of Contents

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01 79 00	Demonstration and Training

DIVISION 02 – EXISTING CONDITIONS

02 41 17	Site Demolition
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DIVISION 03 - CONCRETE

03 05 80	Under-Slab Vapor Barrier – Retarder
03 10 00	Concrete Forming and Accessories
03 20 00	Concrete Reinforcing
03 30 00	Cast-In-Place concrete
03 54 00	Cast Underlayment

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04 20 00	Unit Masonry

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05 05 53	Security Metal Fasteners
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05 31 23	Steel Roof Decking
05 40 00	Cold-Formed Metal Framing
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05 51 33	Metal Ladders
05 52 13	Pipe and Tube Railings
05 73 16	Wire Rope Decorative Metal Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry
06 20 00	Finish Carpentry
06 41 00	Architectural Wood Casework
06 61 16	Solid Surfacing Fabrications

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 19 00	Water Repellants
07 21 00	Thermal Insulation
07 25 00	Weather Barriers
07 41 13	Metal Roof Panels
07 42 13.23	Metal Composite Material Wall Panels
07 46 46	Fiber-Cement Siding
07 54 00	Thermoplastic Membrane Roofing
07 62 00	Sheet Metal Flashing and Trim
07 71 00	Roof Specialties
07 72 00	Roof Accessories
07 84 00	Firestopping
07 92 00	Joint Sealants
07 95 13	Expansion Joint Cover Assemblies

DIVISION 08 - OPENINGS

08 11 13	Hollow Metal Doors and Frames
08 14 23.23	Thermoplastic Clad Wood Doors
08 31 00	Access Doors and Panels
08 34 00	Special Function Doors
08 42 43	Intensive Care Unit / Critical Care Unit Entrances
08 43 13	Aluminum-Framed Storefronts
08 56 53	Security Windows
08 71 13	Power Door Operators
08 80 00	Glazing
08 87 23	Safety and Security Films

DIVISION 09 - FINISHES

09 05 61	Common Work Results for Flooring Preparation
09 21 16	Gypsum Board Assemblies
09 24 00	Cement Plastering
09 30 00	Tiling
09 51 00	Acoustical Ceilings
09 54 23	Linear Metal Ceilings
09 65 00	Resilient Flooring
09 72 00	Wall Coverings
09 72 16.16	Rigid Sheet Wall Coverings
09 91 13	Exterior Painting
09 91 23	Interior Painting
09 96 00	High-Performance Coatings

DIVISION 10 - SPECIALTIES

10 11 00	Visual Display Units
10 22 19	Demountable Partitions
10 26 00	Wall and Door Protection
10 28 00	Toilet, Bath, and Laundry Accessories
10 44 00	Fire Protection Specialties
10 51 13	Metal Lockers
10 51 23	Plastic-Laminate-Clad Lockers
10 73 26	Walkway Coverings

DIVISION 11 - EQUIPMENT

11 05 00	Common Work Results for Equipment
11 19 19	Surface Padding System
11 30 13	Residential Appliances

DIVISION 12 - FURNISHINGS

12 21 13	Horizontal Louver Blinds
12 24 00	Window Shades
12 36 00	Countertops
12 48 13	Entrance Floor Mats and Frames

DIVISION 20 – COMMON FIRE SUPPRESSIONS, PLUMBING, AND HVAC REQUIREMENTS

20 05 13	Motors
20 05 29	Support and Sleeves
20 05 53	Piping and Equipment Identification
20 07 19	Piping Insulation

DIVISION 21 – FIRE PROTECTION

21 13 13	Wet-Pipe Fire Protection Systems
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DIVISION 22 – PLUMBING

22 10 00	Plumbing Piping
22 10 30	Plumbing Specialties
22 20 23	Natural Gas Piping
22 33 33	Electric Domestic Water Heaters
22 40 00	Plumbing Fixtures

DIVISION 23 – MECHANICAL

23 00 00	Basic Mechanical Requirements
23 05 13	Motors
23 05 16	Expansion Compensation
23 05 29	Sleeves, Flashing, Supports, and Anchors
23 05 48	Vibration Isolation
23 05 53	Mechanical Identification
23 05 93	Testing, Adjusting and Balancing
23 05 94	System Preparation for Testing, Adjusting, and Balancing
23 07 13	Ductwork Insulation
23 07 16	Equipment Insulation
23 07 19	Piping Insulation
23 09 23	Building Control and Automation (BCAS)
23 20 10	Piping, Valves and Fittings
23 29 23	Variable Frequency Drives
23 31 00	Ductwork
23 33 00	Ductwork Accessories
23 34 16	Fans
23 37 00	Air Outlets and Inlets
23 62 13	Air-Cooled Split-System Air Conditioning Units
23 63 13	Variable Refrigerant Volume DX Systems

DIVISION 26 – ELECTRICAL

26 00 01	Electrical General Provisions
26 01 25	Electrical Testing
26 05 01	Electrical Basic Materials and Methods
26 05 19	Low Voltage Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 33	Electrical Raceways
26 05 34	Electrical Boxes
26 05 53	Identification for Electrical Systems
26 05 73	Short Circuit Analysis/Fault Study
26 24 16	Panelboards
26 27 01	Electrical Service Entrance
26 27 26	Wiring Devices
26 32 13	Standby Generator Sets
26 36 34	Automatic Transfer/Bypass-Isolation Switches
26 41 13	Lightning Protection for Structures

26 43 13	Surge Protective Devices
26 51 00	Interior Lighting
26 56 00	Exterior Lighting

DIVISION 27 – COMMUNICATIONS

27 00 10	General Requirements for Communications
27 05 33	Pathways for Communications Systems
27 10 00	Structured Cabling System
27 41 00	Integrated Audio-visual Systems
27 51 23	Intercommunications Systems

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 00 10	General Requirements for Security Systems
28 05 33	Pathways for Security Systems
28 10 00	Access Control System
28 20 00	Video Surveillance System
28 31 03	Addressable Fire Alarm System

DIVISION 31 – EARTHWORK

31 00 01	Site Earthwork
31 11 00	Clearing and Grubbing
31 23 00	Grading Excavation and Fill
31 25 00	Erosion and Sedimentation Control
31 63 29	Drilled Concrete Piers and Shafts

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 13 13	Portland Cement Concrete Paving
32 13 19	Concrete Pavement Joints
32 16 13	Concrete Curbs and Gutter
32 80 00	Irrigation
32 90 00	Planting
32 92 23	Sodding

DIVISION 33 – UTILITIES

33 05 16	Utility Structures
33 05 28	Trenching and Backfilling for Utilities
33 41 00	Storm Sewage Systems

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Mental Health Extended Observation Unit.
- B. Project Location:
1207 S. Oak St. La Marque, TX 77569
- C. Architect's Name: Huitt-Zollars.
1001 Fannin St. Suite 4040, Houston TX 77002
- D. The Project consists of the alteration of 21,000 SF existing building to accommodate mental health facility. Project includes interior renovation, replacement of exterior entrances, exterior envelope and site renovation.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract with Construction Manager.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
 - 1. Hazardous materials abatement/removal.
 - 2. Movable cabinets.
 - 3. Furnishings.
 - 4. Small equipment.
 - 5. Healthcare Equipment.
 - 6. Computer, data processing equipment. Refer to Division 26 for Contractor's responsibilities.
 - 7. Audio/video, and sound system equipment.
 - 8. Security and access control system.

9. Signage and graphics.

10. Artwork.

1.05 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.
- D. In submitting a proposal for this work, Contractor acknowledges that performing some work may be required after-hours and/or on weekends to prevent disruption of the Owner's activities. After-hours work will be performed at no additional cost to the Owner.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 - 1. Work by Others.
 - 2. Work by Owner.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Existing building spaces may not be used for storage.
- E. Restrict use of existing facilities, including restrooms, drinking fountains, vending machines, telephones, cafeteria, etc.
- F. Restrict use of all tobacco products. Smoking and the use of tobacco products will not be allowed on the Project site.
- G. Use of loud or profane language or other unacceptable behavior in the vicinity of Owner's employees, patients or visitors will not be tolerated.
- H. Perform slab core drilling and other loud operations on an after-hours basis. Schedule with Owner.
- I. Utility Outages and Shutdown:

-
1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without written notice to Owner and authorities having jurisdiction.
 2. Prevent accidental disruption of utility services to other facilities.

1.07 SCHEDULING WORK

- A. For mutual benefit of Owner and Contractor schedule Work to facilitate timely completion without hampering Owner's operations.
- B. Schedule Work during entire 24 hours of any workday provided laws are not violated and operations do not create public nuisance nor disturb the peace. In event Work is stopped due to such violation, nuisance or disturbance, make corrections necessary to maintain schedule.
- C. Schedule Work that may interfere with Owner's operations 2 weeks prior to such operations. Secure Owner's approval of:
 1. Time of operation.
 2. Interruption of mechanical/electrical services, if any.
 3. Encumbrances to building ingress/egress routes.
 4. Area or place of interfering operations.
 5. Type of interference.
 6. Times and routes of ingress/egress of workmen.

1.08 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" 50-division classification system.
 1. Division 01: Unless otherwise noted, all provisions of the Division 01 sections apply to all sections and all bid packages and contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
 2. "Section Includes" or scope paragraphs appearing at beginning of Sections of the Specifications are a brief indication of the principal Work included, but are not intended to enumerate entire Work of the Section.
- B. Specification Content: 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 include:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall

be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Sentence Structure: Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 3. Vocabulary: 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.
- C. The relation of Specifications and Drawings shall be equal authority and priority. Should they disagree in themselves, or with each other, the bid, and thereby the Contract shall be based on the more expensive combination of quality and quantity of Work indicated. In the event of the above-mentioned disagreement, the Architect shall determine the appropriate Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 10 00

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 01 26 00 - Contract Modification Procedures.

1.03 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.
- G. Provide a sub-schedule for each separate stage of Work specified.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Execute certification by signature of authorized officer.
- E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

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1. On-Site Stored Materials and Equipment: Payment for on-site stored materials and equipment will be considered on an item-by-item basis. Thirty days prior to making application for payment for on-site stored materials, submit to Owner and Architect, for review, a listing of all materials and equipment Contractor intends to store on-site, and for which payment will be requested. Listing shall name materials and equipment to be stored, necessity for on-site storage, and estimated value of materials to be stored. Owner and Architect will respond with reasonable promptness. Long-term storage of materials and equipment will not be considered.
 2. Off-Site Stored Materials and Equipment: Except when circumstances warrant, Owner will not pay the cost of materials which are stored off-site. If Contractor determines that off-site storage is warranted and payment for same is justified, Contractor shall submit letter and certification, 30 days prior to making application for payment, requesting review of same by the Owner and Architect. Letter shall include listing of material and equipment for which payment is requested, Contractor's justification for payment, location of storage site, bonding and insurance coverage, and value of stored materials and equipment. Certification to establish Owner's title to such materials and equipment; that materials and equipment will not be diverted for use at a different project and that contents will be delivered to the job site upon request. Owner reserves the right to determine from the information submitted if payment for off-site stored materials and equipment is warranted. Contractor shall pay travel and per diem costs for Owner and Architect to observe off-site stored materials and equipment when storage is located outside county of project location.
- F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- G. Submit one electronic and three hard-copies of each Application for Payment.
- H. Include the following with the application:
1. Transmittal letter as specified for submittals in Section 01 30 00.
 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 3. Partial release of liens from major subcontractors and vendors.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
1. Issue a final Change Order reflecting approved adjustments to Contract Time and Sum not previously made by Change Order.
- B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01 70 00, including

- a. warranties and guarantees,
 - b. operations and maintenance manuals,
 - c. record drawings,
 - d. other documentation stipulated in the Contract Documents.
2. Certification submitted that Contractor has evaluated the Material Safety Data Sheets (MSDS) for the products used in the Project and that the Project does not contain asbestos.
 3. Certification in writing that record documents as submitted are complete and accurate and reflect actual condition at building site, with signature of Contractor or Contractor's authorized representative.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- B. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.

-
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
 - C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Reference Standards are adequate for this purpose, and must be used.
 - D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
- B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- C. Submittal Form (before award of contract):

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- D. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.

-
3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
 - b. Other unanticipated project considerations.
 - E. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.07 ATTACHMENTS

- A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

END OF SECTION 01 25 00

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Administrative procedures for preparation and processing Contract modifications.

1.02 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- D. Proposal Request is a written instrument prepared by the Architect indicating proposed modifications to the Contract Documents. A Proposal Request is not a Change Order nor a directive to proceed with the Work described therein.
 - 1. Architect will issue proposed modifications on AIA Document G709, "Work Changes Proposal Request".
- E. Contractor with reasonable promptness after receipt of Proposal Request, shall submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - 1. Substantiation of Costs: Provide full information required for evaluation.
 - 2. For each change request, provide following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit applied to the net result of the modifications.
 - d. Justification for any change in Contract Time.

-
- e. Credit for deletions from Contract, similarly documented.
 - f. Support subcontract costs by similar breakdowns.
- F. Contractor may initiate claims for latent or unforeseen conditions by submitting a request for a change to Architect.
- 1. Support each claim for additional costs with complete information listed above in addition to the following information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 2. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Architect upon receipt of Contractor's quotation will, with reasonable promptness, review the Contractor's proposed adjustment to the Contract Sum and Time for general compliance with the intent of the proposed modifications described in the Proposal Request, and make appropriate recommendation to the Owner for Owner's action.
- H. Owner upon receipt of Contractor's quotation and the Architect's recommendation will, with reasonable promptness, decide the appropriate action to be taken.
- 1. If the Owner decides to nullify the Proposal Request or reject the Contractor's proposal for adjustment in the Contract Sum and Time, the Proposal Request and the Contractor's quotation shall be voided with Owner and Contractor having no remaining obligation to each other related to the Proposal Request.
 - 2. If the Owner decides to accept the Contractor's quotation for adjustment to the Contract Sum and Time, the Owner will authorize the Architect to issue an appropriate Change Order

1.03 CHANGE ORDER PROCEDURES

- A. Execution of Change Orders: On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701, "Change Order" as provided in the Conditions of the Contract.
- B. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- C. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- D. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 26 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.
- J. Requests for information (RFI).
- K. Daily reports.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- B. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AIA G810 - Transmittal Letter; 2001.

1.04 DEFINITIONS

- A. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution independent fixed-layout document format.

1.05 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.

- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site and building access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Project staffing and organization plan.
 - 2. Proposed subcontractors and materials list.
 - 3. Historically Underutilized Businesses (HUBs), subcontractors and suppliers list.
 - 4. Requests for information (RFI).
 - 5. Requests for substitution.
 - 6. Shop drawings, product data, and samples.
 - 7. Test and inspection reports.
 - 8. Delegated design data.
 - 9. Manufacturer's instructions and field reports.
 - 10. Applications for payment and change order requests.
 - 11. Progress schedules.
 - 12. Coordination drawings.
 - 13. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 14. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format.
 4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
1. Newforma: www.newforma.com.
- C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
- D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

- A. Project Coordinator will schedule a meeting after Notice to Proceed.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
 - 4. Project Coordinator.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract and Architect.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Submittals Schedule.
 - 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.
 - B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
-

5. Major subcontractors.

6. Project Coordinator.

C. Agenda:

1. Use of premises by Owner and Contractor.

2. Owner's requirements.

3. Construction facilities and controls provided by Owner.

4. Temporary utilities provided by Owner.

5. Survey and building layout.

6. Security and housekeeping procedures.

7. Schedules.

8. Application for payment procedures.

9. Procedures for testing.

10. Procedures for maintaining record documents.

11. Requirements for start-up of equipment.

12. Inspection and acceptance of equipment put into service during construction period.

13. Procedures for infectious control and Interim Life Safety Measures (ISLM).

D. Record minutes and distribute copies within two days after meeting to participants, with electronic .pdf format copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, and Owner, as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.

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2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review Request for Information (RFI) logs.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with electronic .pdf format copies to Architect, Owner, participants, and those affected by decisions made.

3.05 PREINSTALLATION MEETING

- A. See Section 01 70 00 for preinstallation meeting requirements.

3.06 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 30 days after date established in Notice to Proceed, submit preliminary progress schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 10 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

3.07 PROPOSED SUBCONTRACTORS AND MATERIALS

- A. Proposed Subcontractors:
1. As soon as practicable After Award of Contract, submit in electronic .pdf format through Architect's electronic submittal service, Newforma, the names of subcontractors and

material suppliers tabulated by relevant specification section.

2. Upon review by the Owner and Architect, Contractor will be notified in writing of objections to any parties on the list. No objections constitute acceptance.
3. Acceptance of any subcontractor or materials supplier will not relieve the Contractor from responsibilities called for in the Contract Documents, nor will acceptance of a subcontractor establish approval of any particular process or material.

B. Proposed Materials:

1. As soon as practicable After Award of Contract, submit in electronic .pdf format through Architect's electronic submittal service, Newforma, a list of the following types of materials proposed for installation:
 - a. Materials not specified.
 - b. Materials selected from a specification citing more than one manufacturer.
 - c. Material selected to conform to reference specifications. For materials specified by reference standards, also include the following:
 - 1) Product, trade name.
 - 2) Model and catalogue number.
 - 3) Manufacturer's data: Performance & test data; Reference standards.
 - d. Address of manufacturer.
 - 1) Product, trade name.
 - 2) Model and catalogue number.
 - 3) Manufacturer's data: Performance & test data; Reference standards.
2. Tabulate list by specification section and include the name and manufacturer of each material.
3. Delay in submitting materials list may result in Architect imposing a "no substitution" designation on the relevant items.
4. Submit "or equal" products prior to Bid date, without exception. Submittals will only be accepted from prime bidders.
5. Do not submit any material for approval that cannot be verified as still in production; no discontinued materials shall be specified or submitted.
6. Provide adequate proof of product availability at request of Owner or Architect.

3.08 SUBMITTAL SCHEDULE

- A. Submit schedule in electronic .pdf format through Architect's electronic submittal service, Newforma, that includes a list of required submittals, within 30 days after Award of Contract.

- B. Format submittal schedule to indicate identification number, description, and pertinent dates for submittal, review, and product delivery to Project site.
- C. Update submittal schedule monthly and distribute at the monthly Progress meeting.

3.09 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
 - B. Photography Type: Digital; electronic files.
 - C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
 - D. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.
 - 6. Final completion, minimum of ten (10) photos.
 - E. Views:
 - 1. Consult with Architect for instructions on views required.
 - 2. Provide factual presentation.
 - 3. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 - F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via FTP site.
 - 2. File Naming: Include project identification, date and time of view, and view identification. Establish separate file folder for each photographic submission.
 - 3. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.
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3.10 COORDINATION DRAWINGS

- A. Coordinate Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Above-Ceiling Work: Furnish drawings for coordination of all trades involving Work in above-ceiling spaces. Procure and coordinate drawings from various trades involved. Produce drawings at a minimum scale of one-quarter inch equals one foot ($1/4" = 1'-0"$). Submit drawings to Architect as soon as practicable. Coordination drawings to include, as a minimum, the following trades:
 - 1. HVAC ductwork, including fire dampers, VAV boxes and fan coil units.
 - 2. HVAC piping.
 - 3. Pneumatic tube system.
 - 4. Gravity drainage systems.
 - 5. Fire protection sprinkler system.
 - 6. Electrical systems.
 - 7. Medical gas distribution system.
 - 8. Other utilities as may be necessary.
- C. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- D. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing indicated for pipes, ducts and conduits as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas (except as otherwise indicated), conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Execute incidental cutting and patching to integrate elements of Work. Execute cutting to uncover ill-timed, defective, and non-conforming Work, provide openings for penetrations of existing surfaces, and to provide samples for testing. Seal penetrations through floors, walls and ceilings to match adjacent surfaces. Submit written notice to Architect and Owner designating time, location and scope of cutting Work affecting structural integrity.

3.11 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.

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1. Coordinate with Contractor's construction schedule and schedule of values.
 2. Format schedule to allow tracking of status of submittals throughout duration of construction.
 3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.12 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review in electronic .pdf format through Architect's electronic submittal service, Newforma, for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.13 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.

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5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge in electronic .pdf format through Architect's electronic submittal service, Newforma, as contract administrator. No action will be taken.

3.14 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Other types as indicated.
- D. Submit for Owner's benefit in electronic .pdf format through Architect's electronic submittal service, Newforma, during and after project completion.

3.15 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 1. Number of copies, and distribution routing will be established at Preconstruction Meeting.
- B. Document Size:
 1. Written data submittals: Not larger than 8-1/2 x 11 inch paper, typed and including project information title block specified below under SUBMITTAL PROCEDURES.
- C. Documents for Information: Submit PDF electronic file.
- D. Documents for Project Closeout: Submit PDF electronic file of submittal originally reviewed.
- E. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. Retained samples will not be returned to Contractor unless specifically so stated.

3.16 ELECTRONIC SUBMITTAL PROCEDURES

A. General Requirements:

1. Electronic Submittals Intent: To expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
2. Transmit shop drawing and product data submittals to Architect in electronic (PDF) format.
3. Electronic submittal process is not intended for color samples, color charts, or physical material samples.

B. Software Requirements: Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

C. Converting Documents:

1. Prepare documents for submittal by converting to PDF format.
2. Legible scanned PDF files of paper drawings are acceptable, however PDF sets created by converting CAD or Revit documents using PDF software are preferable.
 - a. Scanned sets are more difficult to annotate, are usually less legible, and produce larger attachment sizes.
 - b. Scanned submittals that are not legible will not be reviewed and will be returned, "Revise and Resubmit."

D. Submittal Identification and Information: Identify and incorporate information in each electronic submittal file 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. Limit submittal package to a single specification section submittal requirement.
3. Name file with submittal number or other unique identifier, including revision identifier.
 - a. Submittal File Name: Use project identifier (TMH) and Specification Section number followed by a decimal point and then a sequential number (e.g., TMH-061000.01).
 - 1) Resubmittals: Include an alphabetic suffix after another decimal point (e.g., TMH-061000.01.A).
4. Provide means for permanent insertion of Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements

of the Work and Contract Documents.

5. Include the following information as appropriate on an inserted cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Name of subcontractor.
 - h. Name of supplier.
 - i. Name of manufacturer.
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Other necessary identification.
 6. Options: Identify all options and selections on the shop drawing and data sheets.
 - a. Delete all options and selections that are not applicable.
 - b. Do not submit generic data sheets or cut sheets without specific mark-ups clearly indicating components or options to be provided.
 - c. Unmarked data sheets and cut sheets will not be reviewed and will be returned, "Revise and Resubmit."
 7. Transmitting Electronic Submittals:
 - a. Submit electronic submittals as PDF electronic files directly to Architect's electronic submittal service, Newforma, site established for the project.
 - b. Subject Line: Use the same name as the attachment file name, but without the file type extension (that is, without .pdf).
 - c. File Resolution: Submit required submittals in PDF electronic file format.
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- 1) Product Data: Scanned with a minimum resolution of 100 dpi to a maximum 300 dpi.
 - 2) Shop Drawings: Maximum 150 dpi.
 - d. File Size: Compose documents as one consolidated electronic file whenever possible.
 - 1) Electronic file name shall match submittal name.
 - 2) Electronic files as a substitution for physical sample requirements will not be accepted without prior approval by Architect on a case-by-case basis.
 8. Submittal Return: Architect will return annotated file by Newforma site established for the project.

3.17 SUBMITTAL PROCEDURES

- A. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- B. Comply with progress schedule for submittals related to Work progress. Coordinate submission of related items.
- C. For each submittal for review, allow 15 working days excluding delivery time to and from the Contractor. Depending on the complexity or volume of the submittal, the minimum time may be expanded to four (4) weeks. This time shall be considered when scheduling submittals.
- D. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
- E. When revised for resubmission, identify all changes made since previous submission.
- F. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- G. Submittals not requested will not be recognized or processed.

3.18 SHOP DRAWINGS

- A. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 1. The Contractor represents and warrants that Shop Drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the Shop Drawing is prepared and, if required by the Contract Documents or applicable law, by an engineer currently licensed in the State in which the Project is located.

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- B. Submit PDF electronic file through Architect's electronic submittal service, Newforma. After review, distribute in accordance with requirements in Article on Submittal Procedures, above.

3.19 PRODUCT DATA

- A. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturer's standard data to provide information unique to the Work.
- B. Submit PDF electronic file in accordance with requirements in Article on Submittal Procedures, above and through Architect's electronic submittal service, Newforma.
- C. Products shall be free of asbestos and nontoxic in nature as stated by the Material Safety Data Sheet (MSDS) submitted with each product.
- D. Architect will not review non-LEED submittals that include MSDS and will return the entire submittal for resubmittal with MSDS sheets removed.

3.20 MANUFACTURER'S INSTRUCTIONS

- A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, in PDF electronic file through Architect's electronic submittal service, Newforma.

3.21 SAMPLES

- A. Submit full range of manufacturer's standard colors, textures, and patterns for Architect's selection. Submit samples for selection of finishes within 30 days after date of Contract.
- B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing Work.
- C. Include identification on each sample, giving full information.
- D. Submit the number specified in respective Specification Section; the Architect will retain one. Reviewed samples that may be used in the Work are indicated in the respective Specification Sections.
- E. Provide field samples of finishes at Project as required by individual Specifications Section. Install sample complete and finished. Acceptable samples in place may be retained in completed Work.

3.22 COLOR SELECTIONS

- A. Within 60 days of Notice to Proceed, submit at one time all materials requiring a color selection.
 - 1. Allow 30 working days in Project Schedule after submission of color submittals to Architect for preparation and approval of comprehensive color schedule.

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2. Submit samples for color selection in the full range of applicable manufacturer's full line of standard colors.
- B. After receipt of all color samples, Architect will prepare proposed comprehensive color schedule for Owner's review and approval. Following Owner's approval, color schedule will be released to the Contractor for ordering materials.
1. No color selection will be released until all colors are approved in the comprehensive color schedule.
- C. If the Contractor is unable to submit all color selections/samples within 60 days after "Notice to Proceed", Architect may proceed with preparing the color schedule using Specified Products which the Contractor shall be required to match at no additional cost to the Owner.

3.23 ARCHITECT'S/ENGINEER'S ACTION

- A. Except for submittal for record, information or similar purposes, the Architect will review each submittal required by the Contract Documents in the manner indicated below. The Contractor will remain responsible for compliance with the Contract Documents notwithstanding this review.
- B. The Architect will stamp each submittal with a uniform action stamp. The stamp will be appropriately marked as follows to indicate the action to be taken by the Contractor after the review:
1. Where submittals are marked "REVIEWED NO EXCEPTIONS NOTED", that part of the Work covered by the submittal may proceed, provided it complies with requirements of the Contract Documents. Final acceptance of any Work will depend upon compliance with Contract Documents.
 2. Where submittals are marked "REVIEWED EXCEPTIONS AS NOTED", that part of the Work covered by the submittal may proceed, provided it complies with notations or corrections on the submittal and with requirements of the Contract Documents. Final acceptance of any Work will depend upon compliance with Contract Documents.
 3. When submittals are marked "RESUBMIT FOR RECORD", that part of the Work covered by the submittal may proceed, provided it complies with notations or corrections on the submittal and with requirements of the Contract Documents. Revise or prepare a new submittal in accordance with the notations indicated on the submittal for record purposes. Final acceptance of any Work will depend upon compliance with Contract Documents.
 4. When submittals are marked "PARTIAL RESUBMIT", do not proceed with that part of the Work indicated by the notations as requiring resubmittal, including purchasing, fabrication, delivery, or any other activity. Revise or prepare a new partial submittal in accordance with the notations indicated on the submittal for another review. The part of the Work covered by the submittal and indicated as not requiring resubmittal may proceed, provided it complies with notations or corrections on the submittal and with requirements of the Contract Documents. Final acceptance of any Work will depend upon compliance with

Contract Documents.

5. When submittals are marked "REVISE & RESUBMIT", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or any other activity. Revise or prepare a new submittal in accordance with the notations indicated on the submittal for another review. Do not allow submittals marked "REVISE & RESUBMIT" to be used in any way on the Project.
6. When submittals are marked "REJECTED", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or any other activity. Revise or prepare a new submittal in accordance with the requirements of the Contract Documents. Do not allow submittals marked "REJECTED" to be used in any way on the Project.
7. When submittals are marked "RECEIVED FOR RECORD", that part of the Work covered by the submittal may proceed. It has been determined that the submittal is for record purposes only and has not been reviewed.
8. When submittals are marked "NO ACTION TAKEN", that part of the Work covered by the submittal may proceed. It has been determined that the submittal has been reviewed and is for information only. Some submittals that may be included in this category include, Coordination Drawings, Operations & Maintenance manuals, Record Drawings and Engineered Shop Drawings which bear a separate engineer's seal.

3.24 REQUESTS FOR INFORMATION

- A. A Request for Information (RFI) is a written request issued by Contractor with respect to the need for clarification, interpretation, or additional information regarding requirements of the Contract Documents.
- B. In order for an RFI to be considered valid, the following requirements shall be met. RFI's which deviate from these requirements will be returned unreviewed.
 1. Generated by Contractor on a form issued by Architect during Preconstruction Meeting.
 2. Complete all blanks on form.
 3. Content of an RFI shall pertain to a single specific subject, and not be general in nature.
 4. Dated and numbered sequentially.
 5. Reference pertinent Contract Documents: Specification Section, Drawing number, detail number, or addendum.
 6. Include, at a minimum, one Contractor-proposed resolution based on Contractor's own review and interpretation of the Contract Documents.
 7. Indicate impact that Contractor's proposed resolution would have on Contract Sum and Contract Time.

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- C. Submit RFI's in accordance with requirements in Article on Submittal Procedures above and through Architect's electronic submittal service, Newforma, a minimum of 14 days prior to commencing Work associated with the RFI. Contractor shall anticipate a minimum of 14 working days for Architect's response. Contractor shall review and respond to all RFI's from Contractor's subcontractors and vendors.
 - D. RFI's indicating the following will be considered invalid and will be returned unreviewed:
 - 1. Request for substitution in the form of an RFI. Refer to Section 01 60 00 for substitution procedures.
 - 2. RFI's which pertain to means and methods of construction.
 - 3. When information requested on RFI is contained in Contract Documents.
 - E. Owner reserves the right to withhold sufficient sums from Contractor's Applications for Payment to offset Architect's costs for researching invalid RFI's at a rate previously agreed to between Owner and Architect.
 - F. If, in Architect's opinion, the clarification, interpretation, or additional information requested in an RFI should have, or could have been requested prior to bidding, Architect's response will be considered that required under Section 01 10 00/1.10C.
 - G. Architect's response to Contractor's RFI shall be considered a documented change to the Contract Documents. Architect's response to an RFI will be consistent with the intention of, and reasonably inferable from the Contract Documents, or will make minor changes in the Work that will not affect Contract Sum or Contract Time. If Contractor does not agree, Contractor shall submit written notice in accordance with Contract Documents before proceeding with Work indicated, or Work affected.

3.25 DAILY REPORTS

- A. Prepare a daily report concerning construction site events and submit copies to Architect and Owner on a weekly basis or as otherwise directed. Reports shall contain the following information:
 - 1. List of subcontractors on site.
 - 2. Approximate count of personnel on site.
 - 3. General weather conditions, with high and low temperatures.
 - 4. Meetings and significant decisions.
 - 5. Accidents and unusual events.
 - 6. Stoppages, delays, shortages and or losses.
 - 7. Meter readings and similar recordings.

8. Orders, requests from governing authorities.
9. Change Orders received and implemented.
10. Services connected or disconnected.
11. Equipment or system tests or start-ups.
12. Partial completion, occupancies.

3.26 ELECTRONIC DATA EXCHANGE

- A. For convenience, access to electronic data will be granted upon receipt of the fully executed "Electronic Data Transfer Agreement" included at the end of this section.
- B. Electronic data (Revit) will be will be exchanged via Architect's electronic submittal service, Newforma, upon release for bidding of each bid or document package.
- C. Contractor or Construction Manager will be responsible for conversion to various computer platforms and distribution to suppliers and subcontractors.

3.27 ATTACHMENTS

- A. Electronic Data Transfer Agreement Form

END OF SECTION 01 30 00

SECTION 01 35 16
ALTERATION PROJECT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Products and installation for patching and extending Work.
- B. Transition and adjustments.
- C. Repair of damaged surfaces, finishes and cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 - Cutting and Patching
- B. Section 02 41 19.13 - Selective Building Demolition

1.03 CONTRACTORS USE OF PREMISES

- A. Carefully coordinate work in existing areas so as to prevent interference with the continuous operation of the facility. Proceed only with the approval of the Owner's authorized representative.
- B. Confine these operations to the required limits and take all reasonable precautions to protect the remainder of the property from damage.
- C. Patch and finish to match any adjacent rooms or corridors which are affected in any manner by this work including those spaces above and below the construction site which may provide required access to the work.

PART 2 PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK

- A. New Materials: As specified in product Sections; match existing Products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspection and testing Products where necessary, referring to existing Work as a standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that demolition is complete, and areas are ready for installation of new Work.
- B. Beginning of restoration Work means acceptance of existing conditions.

3.02 PREPARATION

- A. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated plaster, masonry and concrete. Replace materials as specified for finished Work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
- E. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.03 INSTALLATION

- A. Coordinate work of alterations and renovation to expedite completion schedule.
- B. Remove, cut and patch Work in a manner to minimize damage and to provide a means of restoring products and finishes to specified or original condition.
- C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- D. In addition to specified replacement of equipment and fixtures, restore existing mechanical, plumbing and electrical systems to full operational condition.
- E. Install Products as specified in individual Sections.
- F. Maintain integrity of applied fireproofing, fire rated partitions, assemblies and smoke barriers.

3.04 TRANSITIONS

- A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patched Work to match existing adjacent Work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line or division and make recommendation to the Architect.

3.05 ADJUSTMENTS

- A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 - B. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
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- C. Give consideration to variations in the floor levelness resulting from construction quality and live and dead loads imposed on the structure in laying out and detailing the work to be built into altered space.
 - D. Maintain alignment of door heads and other horizontal elements at a constant level; do not follow variations in the floor plane.
 - E. Level floors as required using leveling compound as specified in Section 03 54 00 – Cast Underlayment.
 - F. Fit work at penetrations of surfaces as specified in Section 01 73 29 - Cutting and Patching.

3.06 REPAIR OF DAMAGED SURFACES

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Patch or replace portions of existing fireproofing damaged as a result of this Work.
- C. Repair substrate prior to patching finish.

3.07 RELOCATING EXISTING MATERIALS/EQUIPMENT

- A. Supervise the disconnection and removal of the material or equipment to be relocated, inspect carefully prior to moving.
- B. Submit prompt notification of any reason that equipment will not operate properly when it is reinstalled.
- C. Moving of the material or equipment shall imply acceptance of its condition as satisfactory, and later claims to the contrary shall not lessen responsibility to install the equipment in satisfactory operating condition.
- D. Move, accurately relocate, carefully plumb, level and securely fasten equipment in its designated new location.
- E. Temporarily store and protect material and equipment as required by schedule.

3.08 FINISHES

- A. Finish surfaces as specified in individual Product Sections.
- B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish areas to match existing as indicated, with the following as minimum requirements.
 - 1. Walls: From floor to ceiling and between the nearest corners.
 - 2. Ceiling: The complete surface.

3. Floor: The complete surface unless otherwise shown or unless a matching patch in applied finishes can be made.
4. Openings: The entire unit including frame.
5. Painted cabinets: The entire painted surface.
6. Transparent finish cabinets: Finish new surfaces to match existing.
7. Base: Between nearest corner.

3.09 CLEANING

- A. In addition to cleaning new work, clean existing surfaces and areas disturbed by this work in accordance with Section 01 70 00.

END OF SECTION 01 35 16

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Mock-ups.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 42 16 - Definitions.
- D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- C. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.

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- E. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.
 - F. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
 - G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Test Reports: After each test/inspection, promptly submit PDF electronic copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.

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- d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
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1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
 4. Submit evidence Agency is authorized to operate in the State in which the Project is located.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

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- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
 - G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Make corrections as necessary until Architect's approval is issued.
 - H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
 - I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Attend preconstruction meetings and progress meetings as requested by Owner.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

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2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Provide laboratory with preliminary concrete design mix and other material mixes requiring testing laboratory control.
 5. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 6. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 7. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.
1. Provide written Report to Owner and Architect on action taken and results achieved in correcting non-conforming Work.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of

surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 01 40 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers and enclosures.
- D. Waste removal facilities and services.
- E. Project identification sign.
- F. Temporary storage.

1.02 GENERAL PROCEDURES

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1.03 TEMPORARY UTILITIES

- A. Utilize permanent utilities within existing building for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.04 TELEPHONE SERVICE AND ELECTRONIC COMMUNICATION SERVICE

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Provide cellular telephone service for onsite communication.
- C. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; Cable modem or faster.
 - 3. Email: Account/address reserved for project use.
 - 4. Facsimile Service: Fax-to-email software on personal computer.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 SCAFFOLDS AND RUNWAYS

- A. Furnish, erect and maintain for duration of Work as required, scaffolds, runways, guardrails, platforms and similar temporary construction, as may be necessary for the performance of the Contract.
- B. Facilities shall be of type and arrangement required for their specific use and shall comply with rules and regulation of applicable State and Local Codes.

1.08 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Refer to Section 01 35 33 and Section 02 41 19.13 for requirements.
- C. Paint surfaces exposed to view from Owner-occupied areas.

1.09 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.
- C. Register construction personnel with Owner's Security Office.
- D. Construction personnel shall wear ID badges at all times.
- E. Provide emergency telephone numbers for all contractors, subcontractors and vendors.

1.10 FIRE PROTECTION

- A. Provide and maintain fire extinguishers, fire hoses and other equipment as necessary for proper fire protection during construction. Use such equipment for fire protection only.

1.11 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. On-site parking for construction personnel will be restricted and limited as directed by the Owner.
- E. Contractors and sub contractors are responsible for off-site parking arrangements and cost.
- F. General Contractors to provide logistics plan prior to starting construction detailing how contractors will be transported to the jobsite.

1.12 TEMPORARY ELEVATORS

- A. Existing elevator usage: Schedule with the Owner which elevators shall be used, and allotted elevator use periods for transport of personnel and construction materials.
- B. Remove temporary protection devices after temporary use is no longer required. Restore elevator system to original condition. Replace damaged and worn components.

1.13 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically. Do not permit waste accumulation outside of containers.
- C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.14 PROJECT IDENTIFICATION

- A. Provide temporary signage as required by rules and regulation of applicable State and Local Codes.
- B. No other signs are allowed without Owner permission except those required by law.

1.15 FIELD OFFICES

- A. Field Offices: Not required.
- B. Storage for Tools, Materials and Equipment: Space for storage facilities within the Owner's facilities and grounds is unavailable. Onsite areas for storage are limited. Schedule "just-in-time" delivery of materials that cannot be stored within the limits of the work area.
 - 1. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
 - 2. Move stored products that interfere with operations of the Owner or separate contractor.
 - 3. Obtain and pay for the use of additional storage or work areas needed for operations.
 - 4. Do not load structures with weights that will endanger the structure.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.
- B. Section 01 10 00 - Summary: Identification of Owner-supplied products.
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary storage facilities.

1.03 REFERENCE STANDARDS

- A. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.
- B. NEMA MG 1 - Motors and Generators; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. SCAQMD 1168 - South Coast Air Quality Management District Rule No. 1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

- A. Refer to Section 01 30 00 for submittal procedures.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.

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- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
 - 3. Containing lead, cadmium, or asbestos.
 - C. Motors: Refer to Division 21, 22, and 23, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
 - D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
 - E. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming Several Manufacturers, marked (NO EXCEPTION): No options, and no substitutions allowed.
- D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. Architect will consider requests for substitutions only within 15 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

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- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Include in each request for substitution:
1. Product identification, manufacturer's name and address.
 2. Product Data: Description, performance and test data, reference standards, finishes and colors.
 3. Samples: Finishes
 4. Name and address of similar projects on which product was used: date of installation.
 5. Complete and accurate drawings indicating construction revisions required (if any) to accommodate substitutions.
 6. Data relating to changes required in construction schedule.
 7. Cost comparison between specified and proposed substitution.
- D. A request for substitution constitutes a representation that the submitter:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 2. Will provide the same warranty for the substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
 6. Will provide a substantial advantage to the Owner in terms of cost, project time, energy conservation, or other considerations after deducting additional responsibilities the Owner must assume such as increased maintenance, reduced product life, higher energy usage and other impacts.
- E. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written form request, or when acceptance will require revision to the Contract Documents.
- F. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.
- G. Architect will be the sole judge of acceptability; no substitute shall be ordered, installed or utilized without Architect's prior written acceptance.

H. Substitution Submittal Procedure:

1. Submit .pdf formatted copy of request for substitution for consideration. Limit each request to one proposed substitution.
2. Substitution Request Form: Submit on CSI/CSC Form 13.1A - Substitution Request, available for download through Construction Specifications Institute.
3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer. Note explicitly any non-compliant characteristics.
4. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities: Owner Furnished-Owner Installed (OFOI) Products

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.
6. Install products.

C. Contractor's Responsibilities: Owner Furnished-Owner Installed (OFOI) Products

1. Coordinate delivery scheduling.
2. Make final utility connections.

D. Contractor's Responsibilities: Owner Furnished-Contractor Installed (OFCI) Products

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.

- K. Do not store products directly on the ground.
- L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- N. Prevent contact with material that may cause corrosion, discoloration, or staining.
- O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Disruption of utilities.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 35 16 - Alteration Project Procedures: Procedures for alterations of existing work.
- D. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 015721 - Construction IAQ Management: Additional procedures for nontoxic cleaners.
- G. Section 01 73 29 - Cutting and Patching: Procedures for cutting and patching new and existing work.
- H. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- I. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

- J. Section 01 79 00 - Demonstration and Training: Procedures for demonstration and instruction of Owner's personnel.
- K. Section 02 41 19.13 - Selective Building Demolition: Special procedures for selective demolition and removal of existing work.
- L. Section 07 84 00 - Firestopping.
- M. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

- A. GS-37 - Cleaning Products for Industrial and Institutional Use; 2015.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. See Section 01 73 29 - Cutting and Patching, for submittal procedures.

1.05 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
 - B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
 - C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
 - 2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
 - 3. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
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- D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 - E. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
 - F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.
- B. See Section 01 30 00 for coordination drawing requirements.
- C. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- D. Notify affected utility companies and comply with their requirements.
- E. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- F. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- G. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- H. Coordinate completion and clean-up of work of separate sections.
- I. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS - NOT USED

2.01 CLEANING 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. Use non-toxic materials and methods whenever possible.

1. Comply with GS-37 for general purpose cleaning and bathroom cleaning.
2. Use natural cleaning materials where feasible. Natural cleaning materials include:
 - a. Abrasive cleaners: 1/2 lemon dipped in borax.
 - b. Ammonia: vinegar, salt and water mixture, or baking soda and water.
 - c. Disinfectants: 1/2 cup borax in gallon water.
 - d. Drain cleaners: 1/4 cup baking soda and 1/4 cup vinegar in boiling water.
 - e. Upholstery cleaners: dry cornstarch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
 1. Vacuum clean stud floor tracks prior to wallboard application.
 - B. Seal cracks or openings of substrate prior to applying next material or substance.
 - C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
-

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect fourteen days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute pdf digital copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Lay out exact location of partitions on the floors as a guide to all trades.
 - 2. Trades shall lay out their work and be responsible for proper line, location, elevation and measurement, by dimension from established reference lines.
 - 3. Controlling lines and levels required for mechanical and electrical trades.
- B. Periodically verify layouts by same means.
- C. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
 - B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
 - C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
 - D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
 - E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
 - F. Make neat transitions between different surfaces, maintaining texture and appearance.
-

3.06 DISRUPTION OF UTILITIES

- A. Services (Including but not limited to Pneumatic Tube, Pneumatic Tube, Pneumatic Tube, Pneumatic Tube, and Pneumatic Tube): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Submit requests on the "Disruption of Utilities/Routine" form provided at end of this section.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.
- B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- E. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
- F. Video record training and demonstration sessions. Submit digital video recordings, properly labeled, to Owner prior to final inspection.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Division 23 and 01 40 00.

3.12 FINAL CLEANING

- A. Employ experienced labor or professional cleaners for final cleaning.
 - B. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
 - C. Use cleaning materials that are nonhazardous. See Section 01 57 21 for further requirements.
 - D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
 - E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
 - F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 - G. Remove debris and surface dust from limited access spaces, including plenums, shafts, trenches, equipment vaults, elevator pits, manholes, attics, and similar spaces.
 - H. Clean surface dust from tops of pipes, ducts, HVAC boxes, conduits, fixtures, metal bracing and supports and similar surfaces.
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- I. Replace filters of operating equipment.
- J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 REGULATORY INSPECTIONS

- A. Notify Architect in writing one month prior to the progress of the Work reaching the point of eighty percent (80%) complete for the interim applicable State Department of Health Inspection.
- B. Notify Architect in writing one month prior to the progress of the Work reaching one hundred percent (100%) complete for the Final applicable State Department of Health Inspection.
- C. Assemble necessary personnel, equipment, tools and make necessary preparations to facilitate the inspections by the applicable State Department of Health noted above.
- D. Assemble documentation required by applicable State Department of Health for Final Construction Approval prior to Final Inspection noted above.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
 - B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
 - C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
 - D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
 - E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
 - F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
 - G. Accompany Project Coordinator on Contractor's preliminary final inspection.
 - H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
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1. Should Architect consider that Work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project closeout submittals.
2. Should Architect consider that Work is not finally complete:
 - a. Architect shall notify Contractor, in writing, stating reasons in the form of a list of items to be completed or corrected.
 - b. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Architect certifying that the Work is complete.
 - c. Architect will make final inspection of Work.
- I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performing cutting, fitting and patching required to complete the Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installation of out-of-sequence Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed Work as required for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.02 RELATED REQUIREMENTS

- A. Section 01 7000 - Execution and Closeout Requirements.

1.03 SUBMITTALS

- A. Submit a written request to Architect well in advance of executing cutting or alteration which affects:
 - 1. Work of the Owner or any separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the Project.
 - 2. Description of affected Work.
 - 3. The necessity for cutting, alteration or excavation.
 - 4. Effect on structural or weatherproof integrity of Project.

5. Description of proposed Work:
 - a. Scope of cutting, patching, alteration or excavation.
 - b. Trades who will execute the Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 6. Cost proposal, when applicable.
 7. Written permission of any separate contractor whose Work will be affected.
- C. Should conditions of Work or the schedule indicate a change of products from original installation, submit request for substitution.
- D. Submit a written notice to the Architect designating the date and the time that the Work will be uncovered.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering Work, examine conditions affecting installation of Products, or performance of Work.
- C. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with Work until Architect has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support to assure structural integrity of affected portion of Work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of the Project that may be exposed by cutting and patching Work.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods that will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs.
- B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- C. Restore Work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- D. Where penetrating items are removed at existing partitions and floors, patch openings to match existing construction and finish.
- E. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through non-fire-rated floors and walls, and through finished surfaces.
- F. Refinish entire surfaces to provide an even finish matching adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

END OF SECTION 01 73 29

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.
- D. Regulatory Agency documentation.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
 - 1. Submit one digital blackline set and two CD-ROM disks of PDF formatted Project Closeout documents.
- B. Project Record Submittal Documents:
 - 1. Submit 2 hardcopies of approved submittal documents and shop drawings 15 days prior to final inspection directly to the Owner's Representative, copy Architect on transmittal.
 - 2. Submit 2 CD-ROM disks of PDF formatted approved submittal documents and shop drawings 15 days prior to final inspection directly to the Owner's Representative, copy Architect on transmittal.
- C. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

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3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 4. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Record information concurrent with construction progress.
- D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.

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3. Changes made by Addenda and modifications.
- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- F. Final Record Drawings: Prepare CD-ROM disks of electronic Record Drawings.

3.02 ELECTRONIC RECORD DOCUMENTS

- A. Prepare a complete set of electronic images of the marked Project Record Documents on CD ROM media (Microsoft Windows / PC-compatible format).
- B. Submit electronic documents in one of the following electronic formats.
1. TIFF (Tag Image File Format), uncompressed, resolution of 300 dpi or higher (horizontal and vertical resolution the same), actual document size (100-percent of original size), color depth of 1-bit (black and white).
 2. Adobe Acrobat PDF (Portable Document Format), graphic resolution of 300 dpi or higher, 100-percent graphic scaling, using compression as approved by the Architect.
- C. Include with submitted electronic documents an index of the electronic files. Include the following columns of information.
1. File Name. Coordinate file naming with the Architect.
 - a. Title of Document or Drawing.
 - b. Horizontal Paper Size (measured in inches). Indicate the width of the original paper drawing at its widest horizontal dimension.
 - c. Vertical Paper Size (measured in inches). Indicate the length of the original paper drawing at its widest vertical dimension.
 - d. Scale. Indicate the scale of the original drawing (examples: 1" = 20' or NTS).
 - e. Pixel Depth. Indicate color, grayscale, bi-tonal.

3.03 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.04 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.

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- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
 - C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
 - D. Include color coded wiring diagrams as installed.
 - E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - G. Provide servicing and lubrication schedule, and list of lubricants required.
 - H. Include manufacturer's printed operation and maintenance instructions.
 - I. Include sequence of operation by controls manufacturer.
 - J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - K. Provide control diagrams by controls manufacturer as installed.
 - L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
 - M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - O. Include test and balancing reports.
 - P. Additional Requirements: As specified in individual product specification sections.

3.06 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
 - B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
 - C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 5 inch maximum ring size. When multiple binders are used, correlate data into related
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consistent groupings.

- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.07 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

3.08 DOCUMENTATION FOR REGULATORY AGENCIES

- A. Submit to Architect all documentation required by regulatory agencies having jurisdiction over the Project in separate binders as follows:
 - 1. Requirements of local Building Officials and Code Enforcement Agency.
 - 2. Requirements of local Fire Marshal.
 - 3. Requirements for Final Construction Approval by the applicable State Department of Health.
- B. Assemble documentation for each Agency separately with table of contents in binders with durable plastic covers. Submit each set in triplicate prior to final inspection by each agency.

3.09 MISCELLANEOUS RECORD SUBMITTALS

- A. Submit to Architect certification that Contractor has evaluated the Material Safety Data Sheets (MSDS) for the products used in the Project and that the Project does not contain asbestos.
 - 1. Submit two CD-ROM disks in PDF format of Contractor certification and the Material Safety Data Sheets (MSDS) for the products used in the Project prior to Final Inspection.

END OF SECTION 01 78 00

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Landscape irrigation.
 - 6. Life safety systems.
 - 7. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit not less than four weeks prior to start of training.

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3. Revise and resubmit until acceptable.
 4. Provide an overall schedule showing all training sessions.
 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such a slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of four attendees per training session.
1. Include applicable portion of O&M manuals.
 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
1. Identification of each training session, date, time, and duration.
 2. Sign-in sheet showing names and job titles of attendees.
 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:

1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 79 00

SECTION 02 41 17 – SITE DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for site demolition of facilities and structures.
- B. Extent of demolition work is shown on Drawings. Demolition may, but not necessarily, require removal and disposal, off the Work Site, of the following:
 - 1. Entrances, drives, parking lots and structures, and adjacent landscape work to limits indicated on Drawings, except items to be removed by OWNER prior to start of work.
 - 2. Paving, curbs, gutters, walkways, and related concrete and asphalt.

1.2 SUBMITTALS

- A. In accordance with Division 00 Specifications, the following shall be submitted:
 - 1. Proposed methods and operations of demo to Owner for review and approval prior to start of Work. Include required coordination by agencies for shut-off, capping, and continuation of utility services as required. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of OWNER operations.

1.3 QUALITY ASSURANCE/JOB CONDITIONS

- A. Reference Standards Applicable to this Section
 - 1. ANSI: American National Standards Institute
 - a. A10.6 Safety Requirements for Demolition Operations
 - 2. NFPA: National Fire Protection Association.
 - a. 30: Flammable and Combustible Liquids Code
 - b. 241: Standard for Safeguarding Building Construction and Demolition Operations.

- B. Regulations

Comply with applicable OSHA and EPA regulations and codes and local ordinances.

- C. Condition of Structures and Work Site

OWNER assumes no responsibility for actual condition of site features to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by OWNER insofar as practicable. However, variations within structure and Work Site may occur prior to start of demolition work.

- D. Partial Removal

Items of value to Contractor may be removed, as directed, as Work progresses. Salvaged items shall become the property of the Contractor and shall be transported from Site as they are removed. Storage or sale of removed items on-site will not be permitted.

E. Explosives

Use of explosives will not be permitted.

F. Traffic

Conduct demolition operations and removal of debris to ensure minimum interference with OWNER operations, roads, streets, walks, and adjacent facilities. Do not close or obstruct streets, walks or other facilities without written permission from authorities having jurisdiction. Provide and identify alternate routes around closed or obstructed traffic ways as required by governing regulations.

G. Protection

Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to persons and adjacent buildings, structures, and facilities. Erect temporary covered passageways as required by authorities having jurisdiction. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

H. Damages

Promptly repair damages caused by demolition operations at no cost to OWNER or adjacent property owners.

I. Utility Services

Maintain existing utilities indicated to remain, keep in like service, and protect against damage during demolition operations. Do not interrupt existing utilities serving facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary service during interruptions to existing utilities, as acceptable to governing authorities. Contractor shall disconnect and seal utilities serving structures to be demolished, prior to start of demolition work, upon written direction of OWNER and utility owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION

A. General

Contractor shall comply with NFPA 241 and ANSI A 10.6 prior to and during commencement of demolition.

B. Pollution Control

Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising

and scattering in air to lowest practical level. Comply with governing EPA, OSHA, and local regulations pertaining to environmental protection. Do not create hazardous or objectionable conditions such as flooding and water pollution. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by governing authorities. Return adjacent areas to condition existing prior to start of Work.

C. Below-Grade Construction

Demolish foundation walls to a depth of not less than 12 inches below subgrade or lowest foundation element. Demolish and remove below-grade wood, metal construction, floor construction, and concrete and asphalt slabs.

D. Filling Voids

1. Completely fill below-grade areas and voids resulting from demolition. Coordinate with work of Sections 31 11 00 – Clearing and Grubbing, and 31 00 01- Site Earthwork of these Specifications.
2. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots and other organic matter.
3. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris.
4. Place fill materials in horizontal layers not exceeding 8 inches in loose depth. Compact each layer at optimum moisture content of fill material to a density as specified in Section 31 00 00 - Earthwork of these Specifications.
5. After fill placement and compaction as specified, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

A. General

Remove from Work Site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials from demolished structures will not be permitted on Site.

B. Removal

Safely transport demolished materials and dispose of legally off Site. Contractor shall comply with NFPA 241, ANSI A 10.6, and NFPA 30, as applicable to the Work of disposal and transport.

END OF SECTION 02 41 17

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition and removal of selected portions of the building or structure.
- B. Salvage of existing items to be reused or recycled.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls.
- B. Section 01 70 00 - Execution and Closeout Requirements.
- C. Section 01 73 29 - Cutting and Patching.
- D. Section 01 78 00 - Closeout Submittals: Record Drawings.
- E. Section 02 41 17 - Site Demolition.

1.03 REFERENCE STANDARDS

- A. ANSI/ASSE A10.6 - Safety and Health Program Requirements for Demolition Operations; 2006.
- B. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 **DEFINITIONS**

- A. Remove: Detach items from existing structure and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods, and equipment to prevent damage to the item and surfaces, disposing of items unless indicated to be salvaged or reinstalled.

1.05 SUBMITTALS

- A. Permits and notices authorizing demolition.

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- B. Certificates of severance of utility services.
 - C. Permit for transport and disposal of debris.
 - D. Demolition procedures and operational sequence for review by Architect.
 - E. Submit list of any items that have been removed and salvaged.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility disconnections are achieved in an orderly and expeditious manner.

1.07 PROJECT CONDITIONS

- A. Verify existing conditions before starting Work.
- B. Protection
 - 1. Do not interfere with use of adjacent building or spaces. Maintain free and safe passage to and from building.
 - 2. Prevent movement or settlement of structures. Provide bracing or shoring. Be responsible for safety and support of structures. Assume liability for building movement, settlement, damage, or injury.
 - 3. Cease operations and notify Architect immediately if safety of structures appears to be endangered. Take precautions to properly support structures. Resume operations only after safety is restored.
 - 4. Do not use cutting torches for removal until Work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.
- C. Existing Services
 - 1. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
 - 2. Arrange and pay for disconnecting, removing and capping utility services within areas of demolition. Disconnect and stub off. Notify the affected utility company 48 hours in advance and obtain approval before starting this Work.
 - 3. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Except where noted otherwise, take possession of materials being demolished. Immediately remove materials from site.
- B. Items to be Reinstalled in the Work: Carefully remove, store and protect for reinstallation items indicated on Drawings to be reused. Carefully clean items immediately before reinstallation.
- C. Items to be Retained by Owner: Carefully remove, deliver and store where directed by Owner salvageable materials and equipment indicated on Drawings to remain property of Owner.

2.02 REGULATORY REQUIREMENTS

- A. Meet applicable requirements of the following organizations unless specific conflicting standards are referenced in this Section.
 - 1. Local authorities having jurisdiction.
 - 2. Applicable regulatory advisories.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Provide weatherproof closures for exterior openings.
- C. Maintain exit requirements.
- D. Provide protection from falling objects over entrances that are to be kept open during normal working hours.
- E. Provide guardrails in stairwells and around open shafts to protect workers. Post clearly visible warning signs.
- F. Perform demolition Work to cause least inconvenience to adjacent occupied building areas.

3.02 DEMOLITION

- A. Perform demolition work in accordance with ANSI/ASSE A10.6 .
- B. Demolish items in an orderly and careful manner items required to accommodate new Work, including Work required for connection to existing building. Provide neat and orderly junctions between existing and new materials.

- C. Perform demolition in accordance with requirements of applicable authorities having jurisdiction.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI (RWP) "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Repair demolition performed in excess of that required, at no additional cost to Owner.
- F. Do not burn materials onsite.
- G. Remove from site contaminated or vermin-infested materials encountered and dispose of by safe means so as not to endanger health of workers and public.
- H. Remove demolished materials from site.
- I. Upon completion of Work remove tools and equipment from site. Remove dust-proof/smoke-proof partitions from site. Repair surfaces damaged by partitions, including nail holes and screw holes, to match adjacent surfaces.

3.03 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 05 80
UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 - GENERAL

1.01 SUMMARY

- A. Products Supplied Under This Section
 - 1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

- B. RELATED SECTIONS
 - 1. Section 03 30 00 Cast-in-place Structural Concrete
 - 2. Section 01 45 23 Structural Testing and Inspection
 - 3. Section 01 33 0 Submittals
 - 4. Section 01 54 2 Construction Waste Management
 - 5. Section 01 35 2 LEED Requirements
 - 6. Section 01 61 1 Environmental Management
 - 7. Section 01 57 0 Pollution Prevention and Control

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
 - 2. ASTM E 154-88 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

- B. American Concrete Institute (ACI)
 - 1. ACI 302.2R-06 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.

1.03 SUBMITTALS

- A. Quality Control / Assurance
 - 1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
 - 2. Manufacturer's samples, literature
 - 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation.

- B. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
 - 1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 - 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

- b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.

1.04 SUBSTITUTIONS

- A. Product Review
 1. Request must be made 14 days prior to bid date to allow time for proper review. Reviews will be at contractor's expense.
 2. Independent laboratory test results showing compliance with ASTM E 1745 Class A, a permeance less than 0.01 Perms (grains/(ft² *hr * in. Hg) before and after the mandatory conditioning tests ASTM E 154 Sections 8,11,12, and 13. (Woven, and recycled plastics are not permitted
 3. Incomplete substitutions will not be accepted.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.

1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 MATERIALS

- A. Vapor Barrier (Performance based specification). When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision. Vapor Barrier membrane must have the following properties.
 1. Permeance as tested after mandatory conditioning (ASTM E 154 sections 8,11,12,13) less than 0.01 Perms [grains/(ft² *hr * in.Hg)]
 2. Other performance criteria
 - a. Strength: ASTM E 1745 Class A
 - b. Thickness: 15 mils minimum

2.05 ACCESSORIES

- A. Seam Tape
 1. Tape must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
 2. Seam Tape
 - a. Manufacturer's standard seam tape.
 - b. Stego Crete Claw (for slabs on void boxes).
- B. Vapor Proofing Mastic
 1. Mastic must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower
- C. Pipe Boots
 1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ensure that subsoil is approved by architect or geotechnical firm
 1. Level and tamp or roll aggregate, sand or tamped earth base.

3.02 INSTALLATION

A. Install Vapor Barrier/Retarder:

1. Installation shall be in accordance with manufacturer's written instructions and ASTM E 1643-09.
 - a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
 - b. Lap Vapor Barrier/Retarder over footings or seal to foundation walls.
 - c. Overlap joints 6 inches and seal with manufacturer's tape.
 - d. Seal all penetrations (including pipes) per manufacturer's instructions.
 - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
 - f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION 03 05 80

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes cast-in-place concrete formwork, for the following:

1. Footings and/or piers.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings.
6. Building frame members.
7. Building walls.

- B. Related Sections:

1. Section 01 45 23 "Testing and Inspection Services".
2. Section 03 30 00 "Cast In Place Concrete".
3. Section 03 20 00 "Concrete Reinforcing".
4. Section 03 38 16 "Unbonded Post Tensioned Concrete".
5. Section 01 33 0 Submittals
6. Section 01 54 2 Construction Waste Management
7. Section 01 35 2 LEED Requirements
8. Section 01 61 1 Environmental Management
9. Section 01 57 0 Pollution Prevention and Control

1.03 REFERENCES

- A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
1. American Concrete Institute (ACI):
 - a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials
 - b. ACI 301 – Specifications for Structural Concrete for Buildings
 - c. ACI 318 – Building Code Requirements for Structural Concrete
 - d. ACI 347 – Guide to Formwork for Concrete
 - e. ACI SP-4 – Formwork for Concrete.

1.04 PERFORMANCE REQUIREMENTS

- A. Design and engineering of formwork, including shores, reshores, false work, bracing, and other temporary supports as well as determining when temporary supports and bracing can safely be removed after the specified curing time is the Contractor's responsibility.
- B. All components of the formwork shall be designed to support all loads imposed during construction including weight of construction equipment, live loads, and lateral loads due to wind and imbalance or discontinuity of building components.
- C. If any post tensioned members exist on the project, the formwork supporting those elements shall:
 - 1. It is essential to take into account the stressing sequence of post-tensioned concrete in the design of the formwork. Any concrete element which is stressed can transfer its weight off the form work to the supporting concrete element in which case the forms for the supporting concrete element must be designed to support the entire load tributary of that element.
 - 2. Forms shall be designed and constructed to permit movement during stressing, both lifting and shortening of the concrete elements.
 - 3. Formwork supporting beams and girders shall be designed to support the weight of the beam or girder's entire tributary area.
 - 4. Formwork supporting post tensioned concrete elements shall not be removed until all concrete supported by the formwork has been fully stressed, but in no case shall the curing time before form removal be less than specified herein.
 - 5. Design, engineering and production of shop drawings for the form work shall be performed under the supervision of a professional engineer.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Shop drawings for layout of pan type forms, if they exist on the project. Layout only - information and details about the support of these forms is not required, as it is the responsibility of the Contractor and his registered engineer
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- C. Manufacturer's product data and installation instruction for propriety materials used in exposed concrete work including form liners, release agents, form systems, ties, and accessories.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
 - 1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.

2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver form materials in manufacturer's packaging with installation instructions.
- B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician. An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.
- B. Testing Agency Qualifications: Refer Section 01 45 23.
- C. Layout and measurement of concrete forms and embedment's, required for work, performed by a licensed surveyor employed by the contractor.
- D. Design, engineering and construction, and removal of formwork are the responsibility of the contractor.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specifications for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

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- F. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 - 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 - 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 - 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 - 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

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- a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 - B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
 - C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
 - D. Permanent Metal Forms for Slabs: Deck material, gauge and rib pattern shall be as noted on Drawings.
 - E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
 - 1. Pans shall be free of dents, irregularities, sag, rust or other deterioration.
 - 2. In areas permanently exposed to view, provide one piece units, manufactured to length between beams or ribs, or segmented units with reinforced butt-joint splices.
 - F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
 - G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
 - H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

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1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch
 3. Class C, 1/2 inch
 4. Class D, 1 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- 3.02 EMBEDDED ITEMS
- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts that are attached to the formwork.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 3. Install dovetail anchor slots in concrete structures as indicated.

4. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 3. Determine compressive strength of in place concrete by testing representative field-cured test specimens according to ACI 301.
- B. Obtaining concrete compressive strength tests for the purposes of form removal shall be the responsibility of the Contractor.
- C. In the absence of cylinder tests, formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit (10 degrees Celsius) for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. When the surrounding air temperature is below 50 degrees Fahrenheit (10 degrees Celsius), that time period shall be added to the minimum listed time period.
- D. Formwork for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span. Two-way conventionally reinforced slabs shall then be reshored until they attain the specified 28 day strength.
- E. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems that allow form removal without displacing shores. However, the Contractor must demonstrate, to the satisfaction of the Architect, that the early removal of forms will not result in excessive sag, distortion or damage to the concrete elements.
- F. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- G. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

- B. The Contractor shall be solely responsible for proper shoring and reshoring. Locate and provide adequate reshoring to support construction without excessive stress or deflection.
- C. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement. Reshores shall be located in the same position on each floor. No construction loads shall be placed on the new construction until all supporting reshores have been installed.
 - 1. Extend shores or reshores from ground to top level in structure three stories or less in height, unless noted otherwise.
 - 2. In structures over three stories in height, extend shores or reshores at least three levels under the level being placed. Extend shores beyond the minimum number of levels if required to ensure proper distribution of loads throughout the structure.
 - 3. In crawl spaces or basement, shores or reshores shall extend to mud pads seated firmly on the soil or to on grade construction.
- D. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.
- E. Bottom tier of reshores shall remain in place until the supported concrete has attained at least 85 percent of the specified 28 day compressive strength and construction loads in excess of 20 psf have been removed but not less than 14 days.

3.05 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be used in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.
- B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Otherwise, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are to be installed.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

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- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.08 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated or to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

3.09 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment

END OF SECTION 03 10 00

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes cast-in-place concrete reinforcement, for the following:
1. Footings and/or piers.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Suspended slabs.
 5. Concrete toppings.
 6. Building frame members.
 7. Building walls.
- B. Related Sections:
1. Section 01 45 23 "Testing and Inspection Services".
 2. Section 03 10 00 "Concrete Forming and Accessories".
 3. Section 03 30 00 "Cast In Place Concrete".
 4. Section 03 38 16 "Unbonded Post Tensioned Concrete".
 5. Section 04 22 00 "Concrete Unit Masonry".
 6. Section 31 20 00 "Earth Moving".
 7. Section 31 63 29 "Drilled Concrete Piers and Shafts".
 8. Section 01 33 0 Submittals
 9. Section 01 54 2 Construction Waste Management
 10. Section 01 35 2 LEED Requirements
 11. Section 01 61 1 Environmental Management
 12. Section 01 57 0 Pollution Prevention and Control

1.03 REFERENCES

- A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
1. American Concrete Institute (ACI)
 - a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
 - b. ACI 301 – Specifications for Structural Concrete for Buildings
 - c. ACI 315 – Details and Detailing of Concrete Reinforcement
 - d. SP-66 ACI Detailing Manual
 2. American Welding Society (AWS)
 - a. AWS D1.1 – Structural Welding Code
 3. Concrete Reinforcing Steel Institute (CRSI)
 - a. CRSI – Manual of Standard Practice
 - b. CRSI 63 – Recommended Practice for Placing Reinforcing Bars

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- c. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
- B. American Society of Testing Materials (ASTM)
- a. ASTM-A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
 - b. ASTM-A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
 - c. ASTM-A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - d. ASTM-A675: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
 - e. ASTM-A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - f. ASTM-A775: Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - g. ASTM-A884: Standard Specification for Epoxy-Coated Wire and Welded Wire Reinforcement.
- C. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement, according to ACI 315 "Details and Detailing of Concrete Reinforcement."
 - 1. Do not reproduce the structural drawings for use as shop drawings.
- C. Bar Supports: Submit manufacturer's product information for bolsters, chairs, spaces, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric.
- D. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
 - 1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 - 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
 - 3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.

- b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
- c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
- 4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
- 5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
- 6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency, installer, and fabricator as indicated herein.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Steel reinforcement and accessories.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Refer Section 01 45 23.
- B. Installer Qualifications: An experienced installer who has completed reinforcing installation work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.
- C. Fabricator Qualifications: An experienced fabricator who has completed reinforcing fabrication work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 - 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 - 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 - 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 - 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.
- C. Low-Alloy-Steel Reinforcing Bars for bars to be welded: ASTM A 706, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.
- D. Stainless-Steel Reinforcing Bars: ASTM A 955, Grade 60, [Type 304] [Type 316L], deformed.
- E. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60 or ASTM A 706, deformed bars, assembled with clips.
- F. Plain-Steel Wire: ASTM A 82, as drawn .

- G. Deformed-Steel Wire: ASTM A 496.
- H. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- I. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.05 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, or other unacceptable materials.

2.06 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material. Bars used for concrete reinforcement shall meet following requirements for fabricating tolerances:
 - 1. Sheared length: Plus or minus 1 inch.
 - 2. Depth of truss bars: Plus 0, minus ½ inch.
 - 3. Overall dimensions of stirrups, ties, and spirals: Plus or minus ½ inch.
 - 4. Other bends: Plus or minus 1 inch.
- B. For bars with end bearing splice couplers, bar ends shall terminate in flat surfaces, within 1.5 degrees of a right angle to axis of bars and shall be fitted within 3 degrees of full bearing after assembly.

2.07 DOWEL BAR ANCHORS/SPLICERS

- A. A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published I.C.B.O. test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable:
 - 1. Richmond Screw Anchor "Dowel Bar Splicer"
 - 2. Erico "Lenton Form Saver"
 - 3. Dayton Barsplice "Grip-Twist"

2.08 MECHANICAL SPLICES

- A. A. Provide mechanical splices designed to develop, both in tension and compression, 125% of minimum ASTM yield strength of the smaller bar being coupled, as evidenced by published I.C.B.O test reports. The following bar splicing systems are acceptable.
1. Erico "Cadweld C-Series"
 2. Erico "Lenton"
 3. Dayton Barsplice "Bar Grip"
 4. Dayton Barsplice "Grip Twist"

2.09 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

- A. Steel Shapes and Plates: Conform to ASTM A36, "Specification for Structural Steel".
- B. Headed Stud Anchors: Headed studs welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.
- C. Welding Electrodes: AWS 5.5, Series E70.
- D. Welded Deformed Bar Anchors: Welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.
- E. All metal assemblies exposed to earth, weather or moisture, including exposure to a crawl space environment, shall be hot dip galvanized.

2.010 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

- A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," and AWS D1.1. Welding shall be done by AWS certified welders.
- B. Welding of deformed bar anchors and headed stud anchors shall be done by full fusion process equal to that of TRW Nelson Stud Welding Division of KSM Welding Services Division, Omark, Ind. A minimum of two headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.
- C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing laboratory. Under no circumstances is ordinary reinforcing (ASTM A615) to be welded.
- D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 - EXECUTION

3.01 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.02 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Provide minimum concrete covering for reinforcement as shown in the Structural General Notes.
- G. Place bars to following tolerances:
 - 1. Clear distance to formed surfaces: Plus or minus $\frac{1}{4}$ inch.
 - 2. Minimum spacing between bars: Minus $\frac{1}{4}$ inch.
 - 3. Top bars in slabs and beams:
 - a. Members 8 inches deep or less: Plus or minus $\frac{1}{4}$ inch.
 - b. Members between 8 and 24 inches deep: Plus or minus $\frac{1}{2}$ inch.
 - c. Members more than 24 inches deep: Plus or minus 1 inch.
 - 4. Crosswise of members: Spaced evenly within 2 inches.
 - 5. Length of members: Plus or minus 2 inches.

- H. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter, or enough to exceed above tolerances, resulting arrangement of bars subject to approval.
- I. Support reinforcement and fasten together to prevent displacement by construction loads or placing concrete beyond tolerances indicated.
- J. Unless permitted by Engineer, do not bend reinforcement after embedding in hardened concrete.

3.03 FIELD QUALITY CONTROL

- A. Testing and Inspecting: See Section 01 45 23.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Footings.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Suspended slabs.
 5. Concrete toppings.
 6. Building frame members.
 7. Building walls.
- B. Related Sections:
1. Section 01 45 23 "Structural Testing and Inspection Services".
 2. Section 03 20 00 "Concrete Forming and Accessories".
 3. Section 03 10 00 "Concrete Reinforcing".
 4. Section 03 15 13 "Waterstops".
 5. Section 03 05 80 "Under-slab Vapor Barrier – Retarder".
 6. Section 31 63 29 "Drilled Concrete Piers and Shafts".
 7. Section 01 33 0 Submittals
 8. Section 01 54 2 Construction Waste Management
 9. Section 01 35 2 LEED Requirements
 10. Section 01 61 1 Environmental Management
 11. Section 01 57 0 Pollution Prevention and Control

1.03 REFERENCES

- A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
1. ACI 301 – Specification for Structural Concrete.
 2. ACI 302 – Guide for Concrete Floor Slab Construction.
 3. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete.
 4. ACI 305 – Hot Weather Concreting.
 5. ACI 306 – Cold Weather Concreting.
 6. ACI 308 – Guide to Curing Concrete.
 7. ACI 309 – Guide for Consolidating Concrete.
 8. ACI 311 – ACI Manual for Concrete Inspection.
 9. ACI 318 – Building Code Requirements for Reinforced Concrete.
 10. ACI 347 – Guide to Concrete Formwork.
 11. ACI 207 – Mass Concrete.

12. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
13. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
14. ACI 212.3 – Chemical Admixture for Concrete.
15. ACI 212.4 – Guide for the use of High Range Water Reducing Admixtures in Concrete.
16. ACI 214 – Evaluation of Strength Test Results of Concrete.
17. ACI 303 – Guide to Cast in Place Architectural Concrete Practice.
18. Concrete Reinforcing Steel Institute, “Manual of Standard Practice”.

- B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.04 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture include the following information. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Each proposed mix design shall be accompanied by a complete standard deviation analysis based on at least 30 consecutive strength tests, or by three laboratory trial mixtures with confirmation tests.
 2. Proportions of cement, fine, and coarse aggregate, and water.
 3. Design strength.
 4. Maximum slump.
 5. Air Content.
 6. Maximum water / cement ratio.
 7. Maximum and minimum concrete temperature that is acceptable at time of placement for which the manufacturer can guarantee the strength of the concrete.
 8. Type cement and aggregates.
 9. Type and quantities of all admixtures.
 10. Air dry density and splitting tensile strength for lightweight concrete determined in accordance with ASTM 330.
 11. Type, color, and quantities of integral coloring compounds, where applicable.
 12. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Refer Section 03 20 00.
- D. Formwork Shop Drawings: Refer Section 03 10 00.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

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- F. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
 3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
 4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
 5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
 6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Fiber reinforcement.
 4. Curing compounds.
 5. Floor and slab treatments.
 6. Bonding agents.
 7. Adhesives.
 8. Semi rigid joint filler.
 9. Joint-filler strips.
 10. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: See Section 01 45 23.
 - 1. Contractor's responsibility to testing laboratory.
 - a. Furnish all labor and materials as required to assist testing agency in obtaining, making and handling samples at the jobsite.
 - b. Advise the Owner's Testing Laboratory sufficiently in advance of operations to allow adequate time for the assignment of testing personnel.
 - c. Furnish and maintain adequate facilities for proper curing of concrete test specimens on the project site in accordance with ASTM C31.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
- H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.

- c. Ready-mix concrete manufacturer.
- d. Concrete subcontractor.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 - 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 - 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 - 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 - 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 FORM-FACING MATERIALS

- A. See Section 03 10 00.

2.05 STEEL REINFORCEMENT

- A. See Section 03 20 00.

2.06 REINFORCEMENT ACCESSORIES

- A. See Section 03 20 00.

2.07 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I or Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C. Carbon content shall not exceed 3 percent by volume.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 1-1/2 inches, 1 inch, or 3/4 inch nominal as indicated on Drawings for specific uses.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94 and potable.

2.08 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that contain not more than 0.05 percent water soluble chloride ions. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters.
 - b. Davis Colors.
 - c. Dayton Superior Corporation.
 - d. Hoover Color Corporation.

- e. Lambert Corporation.
 - f. QC Construction Products.
 - g. Rockwood Pigments NA, Inc.
 - h. Scofield, L. M. Company.
 - i. Solomon Colors, Inc.
2. Color: As selected by Architect from manufacturer's full range.

2.09 CONCRETE MIX DESIGNS

- A. Selection of Proportions: Proportions of ingredients for concrete mixes shall be determined by a qualified concrete supplier in accordance with the requirements of ACI 301.
- B. Required average strength above specified strength: Determination of required average strength above specified strength shall be based on the standard deviation record of the production facility in accordance with ACI 301. Calculation of standard deviation of compressive strength results shall be made in accordance with ACI 214. If a suitable record of strength tests is not available, proportions shall be selected on the basis of laboratory trial batches to produce an average strength greater than the strength $f'c$ by the amount defined in ACI 301.

2.010 VAPOR RETARDERS

- A. See Section 03 05 80.

2.011 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 8 sieve.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc.; Emery.
 - b. Dayton Superior Corporation; Emery Tuff Non-Slip.
 - c. Lambert Corporation; EMAG-20.
 - d. L&M Construction Chemicals, Inc.; Grip It.
 - e. Metalcrete Industries; Metco Anti-Skid Aggregate.
- B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc.; A-H Alox.
 - b. BASF Construction Chemicals - Building Systems; FricTex NS.
 - c. L&M Construction Chemicals, Inc.; Grip It AO.

2.012 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ChemMasters; Chemisil Plus.
 - b. ChemTec Int'l; ChemTec One.
 - c. Conspec by Dayton Superior; Intraseal.
 - d. Curecrete Distribution Inc.; Ashford Formula.
 - e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
 - f. Edoco by Dayton Superior; Titan Hard.
 - g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
 - h. Kaufman Products, Inc.; SureHard.
 - i. L&M Construction Chemicals, Inc.; Seal Hard.
 - j. Meadows, W. R., Inc.; LIQUI-HARD.
 - k. Metalcrete Industries; Floorsaver.
 - l. Nox-Crete Products Group; Duro-Nox.
 - m. Symons by Dayton Superior; Buff Hard.
 - n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
 - o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.
- C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Floor Products; Retro-Plate 99.
 - b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
 - c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.013 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.014 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.015 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, as indicated in Structural General Notes.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

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- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.016 NON-SHRINK GROUT

- A. Grout shall be prepackaged, non metallic, and non gaseous. It shall be non-shrink when tested in accordance with ASTM-C1107 Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through the flow cone after slight agitation, in temperatures of 40 degrees to 90 degrees Fahrenheit. Grout shall be bleed free and attain 7,500 psi compressive strength in 28 days at fluid consistency. Certified independent test data required. Approved products include the following:
1. "Euco NS" by Euclid Chemical Company
 2. "Masterflow 713" by Master Builders.

2.017 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as indicated in Structural General Notes:

2.018 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.019 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

- A. See Section 03 10 00.

3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. See Section 03 10 00.

3.04 SHORES AND RESHORES

- A. See Section 03 10 00.

3.05 VAPOR RETARDERS/BARRIERS

- A. See Section 03 05 80.

3.06 STEEL REINFORCEMENT

- A. See Section 03 20 00

3.07 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are specified or otherwise indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.08 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Do not permit concrete to drop freely any distance greater than 10'-0" for concrete containing a high range water reducing admixture or 5'-0" for other concrete. Provide chute or tremie to place concrete where longer drops are necessary. Do not place concrete into excavations with standing water. If place of deposit cannot be pumped dry, pour concrete through a tremie with its outlet near the bottom of the place of deposit.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

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- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- H. Hot-Weather Placement: Comply with ACI 305 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

- A. See Section 03 10 00.

3.010 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated and/or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated and/or to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and/or exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

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2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed **1/4 inch (6 mm)**.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
 - F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
 - G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive granules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive granules.
- 3.011 Concrete Floor Finish Tolerances
- A. Floor Elevation Tolerance Envelope:
 1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:
 - a. Slab-on-Grade, or Slab-on-Void Construction: +/- 3/4"
 - b. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"
 - c. Top surfaces of all other slabs: +/- 3/4"
 - d. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.
- 3.012 MISCELLANEOUS CONCRETE ITEMS
- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
 - B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
 - C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

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- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.013 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water, maximum 2" depth.
 - b. Continuous water-fog spray.

3.014 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturers written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than 28 days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
 4. Control and dispose of waste products produced by grinding and polishing operations.
 5. Neutralize and clean polished floor surfaces.

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- C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.015 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.016 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

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4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.017 FIELD QUALITY CONTROL

- A. Testing and Inspecting: See Section 01 45 23.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.018 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.

1.02 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.
- B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.
- C. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2021.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, mixing instructions, environmental limitations, storage and handling requirements, and installation instructions.
- C. Manufacturer's Instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing cement based products with minimum five years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.06 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cementitious Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX K 13: www.ardexamericas.com/#sle.
 - 2. Custom Building Products: www.custombuildingproducts.com/#sle.
 - 3. H.B. Fuller Construction Products, Inc; TEC Level Set 200 Self-Leveling Underlayment: www.tecspecialty.com/#sle.
 - 4. Mapei Corporation: www.mapei.com/#sle.
 - 5. Maxxon Corporation: www.maxxon.com/#sle.

2.02 MATERIALS

- A. Cast Underlayments, General:
 - 1. Comply with applicable code for combustibility or flame spread requirements.
 - 2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.
- B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 - 1. Compressive Strength: Minimum 4000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
 - 2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
 - 3. Density: 125 pounds per cubic foot, nominal.
 - 4. Final Set Time: 1-1/2 to 2 hours, maximum.
 - 5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.

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- 6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.
 - C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
 - D. Primer: Manufacturer's recommended type.
 - E. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

2.03 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

- A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.
- B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- C. Vacuum clean surfaces.
- D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- E. Close floor openings.

3.03 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Pump or pour material onto substrate. Do not retemper or add water.
 - 1. Pump, move, and screed while the material is still highly flowable.
 - 2. Be careful not to create cold joints.
 - 3. Wear spiked shoes while working in the wet material to avoid leaving marks.
- C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

- D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.
- E. Place before partition installation.
- F. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.04 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Failure of underlayment to bond to substrate (as evidenced by a hollow sound when tapped), or disintegration or other failure of underlayment to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace underlayment in areas of such failures, as directed.

3.06 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 03 54 00

SECTION 04 01 00
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water cleaning of brick clay masonry surfaces.
- B. Replacement of _____ units.
- C. Repointing mortar joints.
- D. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

- A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
 - 1. Require attendance of parties directly affecting work of this section.
 - 2. Review conditions of installation, installation procedures, and coordination with related work.
- B. Scheduling:
 - 1. Perform cleaning and washing of masonry between the hours of 7 am to 11 pm only.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on cleaning compounds.
- C. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

1.06 QUALITY ASSURANCE - MASONRY WORK

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.07 FIELD CONDITIONS - MASONRY WORK

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Restoration and Cleaning Chemicals:
 - 1. Cathedral Stone Products, Inc: www.cathedralstone.com
 - 2. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
 - 3. United Gilsonite Laboratories: www.ugl.com
 - 4. PROSOCO: www.prosoco.com/#sle.

2.02 CLEANING MATERIALS

- A. Cleaning Agent: Detergent type.
- B. Water: Potable

2.03 MORTAR MATERIALS

- A. Comply with requirements of Section 04 20 00.

2.04 MASONRY MATERIALS

- A. Brick: Section 04 20 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION

- A. Protect surrounding elements from damage due to restoration procedures.
 - B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
 - C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
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- D. Cover existing landscaping with tarpaulins or similar covers.
- E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.
- F. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.
- G. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING

- A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.
- B. Support structure as necessary in advance of cutting out units.
- C. Cut away loose or unsound adjoining masonry as directed.
- D. Build in new units following procedures for new work specified in other section(s).

3.04 REPOINTING

- A. Perform repointing prior to cleaning masonry surfaces.
- B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.
- C. Do not damage masonry units.
- D. When cutting is complete, remove dust and loose material by brushing.
- E. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.
- F. Moist cure for 72 hours.

3.05 CLEANING EXISTING MASONRY

- A. Cleaning Detergent: Brush clean masonry surfaces at locations indicated on drawings with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.06 CLEANING NEW MASONRY

- A. Verify mortar is fully set and cured.
- B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

3.07 AGING

- A. Rub in new masonry work to match, as close as possible, adjacent original work.
- B. Continue process until acceptance.

3.08 CLEANING

- A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
- B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.
- C. Clean surrounding surfaces.

END OF SECTION 04 01 00

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Burnished Masonry Units
- C. Clay facing brick.
- D. Mortar and grout.
- E. Reinforcement and anchorage.
- F. Flashings.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- B. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

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- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
 - I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
 - J. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
 - K. ASTM C170/C170M - Standard Test Method for Compressive Strength of Dimension Stone; 2016.
 - L. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
 - M. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.
 - N. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
 - O. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.
 - P. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
 - Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
 - R. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
- D. Samples: Submit two samples of facing brick, ceramic glazed facing brick, and split face units to illustrate color, texture, and extremes of color range.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

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- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
 - C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized as indicated by Architect; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide nonstandard blocks configured for corners.
 - a. Provide bullnose units for outside corners.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture where indicated.
 - 4. Burnished Masonry Units: ASTM C90, normal weight aggregate conforming to ASTM C170/C170M with integral coloring and waterproofing agent.
 - a. Size: Standard units with nominal face dimensions as noted on drawings.
 - b. Special Shapes: Provide non-standard blocks configured for corners, bases, bond beams, lintels and fillers to match block units.
 - c. Product: Match Existing.
 - 1) Color: 12 - Mojave

2) Manufacturer: Best Block

2.02 BRICK UNITS

A. Manufacturers:

1. Acme Brick: www.brick.com
2. Belden Brick: www.beldenbrick.com/#sle.
3. Endicott Clay Products Co; Face Brick - FBX: www.endicott.com/#sle.
4. Other manufacturer that meets requirements.
5. Substitutions: See section 01 60 00 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

1. Product: Match Existing.
2. Nominal size: As indicated on drawings.
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
4. Product: Match Existing Facing brick

2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:

1. Blok-Lok Limited: www.blok-lok.com/#sle.
2. Hohmann & Barnard, Inc: www.h-b.com/#sle.
3. WIRE-BOND: www.wirebond.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

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- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.
 - C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
 - E. Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

2.05 FLASHINGS

- A. Metal Flashing Materials:
 - 1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
 - 2. Prefabricated Metal Flashing: Smooth fabricated 12 oz/sq ft stainless steel (type 304) flashing for surface mounted conditions.
- B. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
 - 1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner.
- C. Membrane Non-Asphaltic Flashing Materials:

2.06 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents

and allow proper cavity drainage.

- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
1. Exterior, loadbearing masonry: Type N.
 2. Exterior, non-loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.
- D. Mix mortar fresh, in quantities immediately required.
- E. Do not use anti-freeze compounds to lower freezing point of mortar.
- F. Retemper only as required to restore required consistency.
- G. Retempering not allowed after mortar has begun to set.
- H. Use no mortar beyond 2-1/2 hours after mixing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

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- C. Refer to drawings for coursing patterns.
 - D. Concrete Masonry Units:
 - 1. Bond: As indicated for different locations.
 - E. Brick Units:
 - 1. Bond: As indicated for different locations.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

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- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.07 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

- A. Place prefabricated T or L shaped joint reinforcement units at wall intersections and corners.

3.08 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
- B. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

3.09 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joint as detailed on drawings.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.

3.12 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

3.15 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 20 00

SECTION 05 05 53
SECURITY METAL FASTENERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Metal fasteners for attaching work specified in other Sections within Ligature-Resistant Spaces as identified on the Drawings.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's technical product literature for each product.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified on Drawings to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

1. Manufacturer: Camcar.
2. Product: Torx Plus.

2.02 FASTENERS

- A. Description: Tamper-resistant fasteners of the hexalobular, pin-reject, internal drive system; complying with ISO Standard 10664; type, size and material as required by conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Acceptance of Surfaces and Conditions:
 1. Examine surfaces and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
 3. Starting Work within a particular area will be construed as acceptance of surface conditions.

3.02 INSTALLATION

- A. Use ligature-resistant metal fasteners for every product and assembly requiring attachment with mechanical fasteners that is exposed to view or accessible in areas identified on the Drawings.

END OF SECTION 05 05 53

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Structural steel.
 2. Prefabricated building columns.
- B. Related Sections:
1. Section 01 45 23 "Testing and Inspection Services".
 2. Section 05 31 13 "Steel Floor Decking".
 3. Section 05 31 23 "Steel Roof Decking".
 4. Section 05 50 00 "Metal Fabrications".
 5. Section 05 51 00 "Metal Stairs."
 6. Section 01 33 0 Submittals
 7. Section 01 54 2 Construction Waste Management
 8. Section 01 35 2 LEED Requirements
 9. Section 01 61 1 Environmental Management
 10. Section 01 57 0 Pollution Prevention and Control

1.03 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
1. Shapes included in ASTM A 6 with flanges thicker than 1 1/2 inches.
 2. Welded built-up members with plates thicker than 2 inches.
 3. Column base plates thicker than 2 inches.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.04 REFERENCES

- A. Comply with applicable provisions of the following specifications and documents: The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise
1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
 2. AISC "Specification for Structural Steel Buildings," including the "Commentary" and the Supplements thereto, as issued.
 3. AISC "Specification for Architecturally Exposed Structural Steel".
 4. AISC's "Seismic Provisions for Structural Steel Buildings".
 5. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".
 6. AWS D1.1 Structural Welding Code.
 7. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
 8. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
 9. SSPC (Steel Structures Painting Council), Painting Manuals, Volumes 1 and 2.
 10. UL Fire Resistance Directory.
- B. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.05 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Prepare submittal documents including connection design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located, employed by the steel fabricator.
- B. Design all structural steel framing connections complying with specified performance:
1. Load Capacity: Resist loads indicated on drawings or resist full capacity of supported framing member if reaction not indicated. Account for connection and member loads and eccentricities.
 - a. Request additional design criteria when necessary to complete connection design.
 2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the design professional in charge of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the design professional in charge. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

-
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. Identify members and connections of the seismic-load-resisting system.
 6. Indicate locations and dimensions of protected zones.
 7. Identify demand critical welds.
 8. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. At full penetration welds, Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
 3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
 4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
 5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
 6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.

1.07 INFORMATIONAL SUBMITTALS

- A. Submit the following informational submittals:

1. Qualification Data: For qualified installer, fabricator, and testing agency.
2. Welding certificates.
3. Mill test reports for structural steel, including chemical and physical properties.
4. Product Test Reports: For the following:
 - a. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - b. Direct-tension indicators.
 - c. Tension-control, high-strength bolt-nut-washer assemblies.
 - d. Shear stud connectors.
 - e. Shop primers.
5. Source quality-control reports.
6. Delegated Design Drawings and Calculations: Signed and sealed by responsible Engineer.
 - a. Connection calculations.

1.08 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, P2, or P3 as applicable for exposure or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 1. AISC 303.
 2. AISC 341 and AISC 341s1.
 3. AISC 360.
 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Preinstallation Conference: Conduct conference at Project site.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.010 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
 - 1. W-Shapes: 60 percent.
 - 2. Channels, Angles, M, S-Shapes: 60 percent.
 - 3. Plate and Bar: 25 percent.
 - 4. Cold-Formed Hollow Structural Sections: 25 percent.
 - 5. Steel Pipe: 25 percent.
 - 6. All Other Steel Materials: 25 percent.
- B. W-Shapes: Refer Structural General Notes.
- C. Channels, Angles, M, S-Shapes: Refer Structural General Notes.
- D. Plate and Bar: Refer Structural General Notes.
- E. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588, Grade 50.
- F. Cold-Formed Hollow Structural Sections: Refer Structural General Notes.
- G. Steel Pipe: Refer Structural General Notes.
 - 1. Weight Class: See Plans.
 - 2. Finish: Black except where indicated to be galvanized.
- H. Welding Electrodes: Comply with AWS requirements.

2.05 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers (All bolts located in Crawl Space): ASTM A 325, Type 1, heavy-hex steel structural bolts.
 - 1. Finish: Hot-dip or mechanically deposited zinc coating.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain or Mechanically deposited zinc coating, where required.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, See Anchor Bolt Schedule on Drawings for Grade.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.

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3. Plate Washers: ASTM A 36 carbon steel.
 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 5. Finish:
 - a. General Condition – Plain
 - b. Crawl Space - Hot-dip zinc coating, ASTM A 153, Class C.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
- I. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Amscot Structural Products Corp.
 - b. Fluorocarbon Company Limited.
 - c. R.J. Watson Bridge & Structural Engineered Systems.
 - d. Seismic Energy Products, L.P.
 2. Mating Surfaces: PTFE and PTFE or mirror-finished stainless steel.
 3. Coefficient of Friction: Not more than 0.05.
 4. Design Load: Not less than 5,000 psi .
 5. Total Movement Capability: 2 inches.
- 2.06 PRIMER
- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - B. Primer (General): Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
 - C. Primer (Crawl Space Steel): Tnemec Perimeprime Series 394.
 - D. Galvanizing Repair Paint: SSPC-Paint 20.
- 2.07 GROUT
- A. Refer Section 03 30 00.
- 2.08 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.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.

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3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.
 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in final approved Shop Drawings.
1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other effects.
 3. Camber structural steel members where indicated. The camber specified is the camber that is measured in the field with the beam on its side so that the beam weight has no effect. During shipment and handling, cambered members shall be supported in a way that will not result in loss of camber.
 4. Camber tolerance
 - a. Beams 50 feet and less; plus or minus 1/2 inch.
 - b. Beams greater than 50 feet; plus or minus 1/2 inch, except tolerance can be increased 1/8 inch for each 10 feet or fraction thereof in excess of 50 feet.
 - c. Contact engineer for members outside specified camber tolerance. Provide engineer with a list of beam locations and actual measured camber amounts. Submit an engineered shoring plan, if requested, that will allow the beam to deflect to the horizontal position after concrete placement without overloading the framing below.
 5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- H. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on approved shop drawings.
1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

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2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes by burning.
- I. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces. Base plates hole sizes for anchor bolts may be oversized to facilitate erection:
 1. Bolts 3/4 inch to 7/8 inch diameter: 1/2 inch oversize.
 2. Bolts 1 inch to 1 1/2 inch diameter: 3/4 inch oversize.
 3. Bolts over 1 3/4 inch diameter: 1 inch oversize.
 - J. Base Plate Washers: Sizes shall be as follows:
 1. 3/4 inch diameter Bolts: 2 inch diameter x 1/4 inch thick
 2. 7/8 inch diameter Bolts: 2 1/2 inch diameter x 5/16 inch thick
 3. 1 inch diameter Bolts: 3 inch diameter x 3/8 inch thick
 4. 1 1/4 inch diameter Bolts: 3 inch diameter x 1/2 inch thick
 5. 1 1/2 inch diameter Bolts: 3 1/2 inch diameter x 1/2 inch thick
 6. 1 3/4 inch diameter Bolts: 4 inch diameter x 5/8 inch thick
 7. 2 inch diameter Bolts: 5 inch diameter x 3/4 inch thick
 - K. Architecturally Exposed Structural Steel (AESS): Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Specification for Architecturally Exposed Structural Steel" for architecturally exposed structural steel.
- 2.09 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, Pretensioned, or Slip critical as required or indicated on Drawings.
 - B. Weld Connections: Comply with AWS D1.1 and AWS D1.8, where required, for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
- 2.010 SHOP PRIMING
- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing) excluding crawl space steel. Crawl space steel shall be primed regardless of whether it is to receive fireproofing.
 5. Galvanized surfaces.

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- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - D. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
 - E. Crawl space steel to be primed to a DFT between 2.5 and 3.5 mils.
 - F. Painting: Prepare steel and apply a one-coat, non-asphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.011 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
 - 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural steel frame and located in exterior walls.

2.012 SOURCE QUALITY CONTROL

- A. Testing Agency: Refer Section 01 45 23.
 - 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.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

- A. Set structural steel accurately in locations, to elevations indicated, and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling 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 it 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."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. 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 is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, Pretensioned, or Slip critical as indicated on Drawings.
- B. Weld Connections: Comply with AWS D1.1 and AWS D1.8 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.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: See Section 01 45 23.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 12 00

SECTION 05 31 23
STEEL ROOF DECKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Roof deck.
- B. Related Requirements:
1. Section 01 45 23 "Structural Testing and Inspection Services"
 2. Section 05 12 00 "Structural Steel Framing".
 3. Section 05 50 00 "Metal Fabrications".
 4. Section 01 33 0 Submittals
 5. Section 01 54 2 Construction Waste Management
 6. Section 01 35 2 LEED Requirements
 7. Section 01 61 1 Environmental Management
 8. Section 01 57 0 Pollution Prevention and Control

1.03 REFERENCES

- A. Comply with applicable provisions of the following specifications and documents. The latest adopted edition of all standard referenced in this section shall apply, unless noted otherwise.
1. AWS D1.1 – Structural Welding Code
 2. AWS D1.3 – Structural Welding Code – Sheet Steel
 3. SDI – Design Manual
 4. SSPC – Painting Manual
 5. UL – Fire Resistance Directory
 6. ICBO – Product Evaluation Reports
 7. FM – Roof Assembly Classifications
- B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

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- C. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
 3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
 4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
 5. General: Submit additional LED submittal requirements included in other sections of the Specifications.
 6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 1. Power-actuated mechanical fasteners.
 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck.
- E. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Refer Section 01 45 23.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

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- C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 - 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 - 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 - 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 - 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

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- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 - C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 - D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.05 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ASC Profiles, Inc.; a Blue Scope Steel company.
 - 2. Canam United States; Canam Group Inc.
 - 3. CMC Joist & Deck.
 - 4. Consolidated Systems, Inc.; Metal Dek Group.
 - 5. Cordeck.
 - 6. DACS, Inc.
 - 7. Epic Metals Corporation.
 - 8. Marlyn Steel Decks, Inc.
 - 9. New Millennium Building Systems, LLC.
 - 10. Nucor Corp.; Vulcraft Group.
 - 11. Roof Deck, Inc.
 - 12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
 - 13. Verco Manufacturing Co.
 - 14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 - 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G60 zinc coating.
 - 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 - 4. Deck Profile: As indicated on plan.
 - 5. Profile Depth: As indicated on plan.
 - 6. Design Uncoated-Steel Thickness: As indicated in Structural General Notes.
 - 7. Span Condition: Triple span or more.
 - 8. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.06 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth unless otherwise indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A 780.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
 - 1. Fasteners shall provide diaphragm shear and uplift resistance equal to or greater than welding indicated herein and on Drawings.

3.03 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: As indicated on Structural Plans.
 - 2. Weld Spacing: As indicated on Structural Plans.
 - 3. Weld Washers: Install weld washers at each weld location if deck gauge is lighter than 22 gauge.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals shown on Structural Plans:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

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- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: See Section 01 45 23.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 23

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes: Requirements including but not limited to:
1. Load bearing wall framing.
 2. Exterior nonload bearing wall framing.
 3. Floor joist framing.
 4. Roof rafter framing.
 5. Ceiling joist framing.
 6. Soffit framing.
 7. Accessories necessary for a complete installation.

1.03 RELATED SECTIONS

1. Section 05 50 00 – Metal Fabrications.
2. Section 09 21 16 – Gypsum Board.
3. Section 01 33 0 Submittals
4. Section 01 54 2 Construction Waste Management
5. Section 01 35 2 LEED Requirements
6. Section 01 61 1 Environmental Management
7. Section 01 57 0 Pollution Prevention and Control

B.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, licensed in the State of Texas, to design cold formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: Indicated on Structural Drawings.
 2. Coordinate the requirements on the Structural Drawings with the requirements of this Section. If a conflict exists, notations on the Structural Drawings take precedence.
 3. The following document governs the Work, except where more restrictive items are specified: AISI Design of Cold-Formed Steel Structural Members Wind Load Minimum Design Loads
 1. As required by code officials having jurisdiction.
 2. Deflection: 1/600 for clear simple spans
 3. Deflection: 1/300 for cantilever conditions and roof parapets
 4. Gauge: 18 gauge minimum, unless noted otherwise.

4. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 5. Studs, tracks, channels, and other light gauge framing members shall conform to requirements of ASTM C955.
 6. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.
 7. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F (67 degrees C).
 8. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure:
 - a. Upward and downward movement of 1-1/2 inches (38 mm).
 9. Design exterior nonload bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold Formed Steel Framing Design Standards:
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.

1.05 SUBMITTALS

- A. Product Data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
 2. Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting and recover and the project site.
 3. VOC data:
 - a. Submit manufacturer's product data for joint compounds. Indicate VOC and chemical component limits of the product. Submit MSDS highlighting VOC and chemical component limits. VOC contents and chemical component limits must be less than the limits of Green Seal's Standard GS-11.
 - b. Submit manufacturer's certification that products comply with Green Seal's Standard GS-11.
 - c. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
 4. Submit the following according to Conditions of the Construction Contract:
 - a. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
 5. General: Submit additional LED submittal requirements included in other sections of the Specifications.

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6. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LED requirements.
- B. Shop Drawings: Submit layout, spacings, sizes, thickness, and types of cold formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
1. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Supplementary Design Details: The general design is presumed adequate to permit compliance with the specified performance. Provide engineering calculations to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Calculations must show design will with stand wind loading commiserate with class and rating of the project.
- 1.06 QUALITY ASSURANCE
- A. Regulatory Requirements:
1. Welding Qualifications: Qualify procedures and personnel according to the following:
- a. AWS D1.1/D1.1M Structural Welding Code - Steel.
- b. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
2. Comply with AISI North American Specification for the Design of Cold Formed Steel Structural Members and Standard for Cold Formed Steel Framing - General Provisions.
- a. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- b. Comply with AISI S230 Standard for Cold Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings.
3. Fire Resistance Ratings: ASTM E 119; testing by a UL. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory*.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold formed metal framing that are similar to those indicated in material, design, and extent.
1. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and structural data.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Protect cold formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 - 1. To the greatest extent possible, provide products and materials that promote stewardship of the earth's resources, promote good indoor environmental quality (IEQ), and promote efficiencies in operational performance.
- B. Provide products listed on the EPA Comprehensive Procurement Guidelines to the greatest extent practicable.
- C. Provide products listed on the USGBC Directory of Products and Services to the greatest extent possible.

2.02 RECYCLED CONTENT

- A. Provide recycled content products to the greatest extent possible.
 - 1. To the greatest extent possible, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

2.03 REGIONAL MATERIALS

- A. Provide Regional materials and products to the greatest extent possible that are extracted and manufactured within the region.
 - 1. Provide materials and products that use a minimum of 20% of building products that are manufactured regionally within a radius of 500 miles from the project site.
 - a. Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesman.
 - 2. Of the regionally manufactured materials used and documented, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

2.04 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CEMCO; California Expanded Metal Products Co.
 - 2. ClarkDietrich Building Systems.
 - 3. Consolidated Fabricators Corp.; Building Products Division.
 - 4. Marino\WARE.
 - 5. SCAFCO Corporation.
 - 6. The Steel Network.

2.05 LOAD BEARING WALL FRAMING

- A. Steel Studs: C shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm).
 - 3. Section Properties: Refer to the Drawings.

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- B. Steel Track: U shaped steel track, of web depths indicated, unpunched, with straight flanges:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-1/4 inches (32 mm).
 - C. Steel Box or Back to Back Headers: C shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm).
 - D. Steel Single or Double L Headers: L shapes used to form header beams, of web depths indicated:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Top Flange Width: 1-5/8 inches (41 mm).
 - 3. Section Properties: Refer to the Drawings.

2.06 EXTERIOR NONLOAD BEARING WALL FRAMING

- A. Steel Studs: C shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm).
 - 3. Section Properties: Refer to the Drawings.
- B. Steel Track: U shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips: Head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AllSteel & Gypsum Products, Inc.
 - b. ClarkDietrich Building Systems.
 - c. MarinoWARE.
 - d. SCAFCO Corporation.
 - e. Simpson Strong-Tie Co., Inc.
 - f. Steel Network, Inc. (The).
 - g. Steeler, Inc.
- D. Single Deflection Track: Single, deep leg, U shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure:
 - 1. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.

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- E. Double Deflection Tracks: Double, deep leg, U shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure:
 - a. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.
 2. Inner Track: Of web depth indicated:
 - a. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.
- F. Drift Clips: Bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.07 SOFFIT FRAMING

- A. Exterior Soffit Frame: C shaped steel sections, of web depths indicated, with stiffened flanges:
1. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm) [0.0538 inch (1.37 mm)].
 2. Flange Width: 1-5/8 inches (41 mm) minimum.

2.08 FRAMING ACCESSORIES

- A. Fabricate steel framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of appropriate thickness and configuration, unless otherwise indicated:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.
- C. Anchors, Clips, and Fasteners:
1. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot dip process according to ASTM A 123/A 123M.
 2. Expansion Anchors: Fabricated from corrosion resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
 3. Power Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with allowable load capacities calculated

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- according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
4. Mechanical Fasteners: ASTM C 1513, corrosion resistant coated, self-drilling, self-tapping, steel drill screws.
 - a. Head Type: Low profile head beneath sheathing.
 5. Welding Electrodes: Comply with AWS standards.
- D. Miscellaneous Materials:
1. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
 2. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, and plasticizing and water reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30 minute working time.
 3. Shims: Load bearing, high density multimonomer plastic, and nonleaching; or of cold formed steel of same grade and coating as framing members supported by shims.
 4. Sealer Gaskets: Closed cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from standard widths to match width of bottom track or rim track members.

2.09 FABRICATION

- A. Fabricate cold formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer written instructions, and specified requirements.
 1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold formed steel framing assembly to a maximum out of square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

3.02 PREPARATION

- A. Before sprayed fire resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire resistive materials, remove only as much as necessary to complete installation of cold formed framing without reducing thickness of fire resistive materials below required thickness to obtain fire resistance rating indicated. Protect remaining fire resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 ERECTION

- A. General:
 - 1. Track Anchors: Install anchors maximum 4 feet - 0 inches on center; design anchors and spacing to carry live, dead and wind loads.
 - 2. Track Splices: Provide channel inserts or weld track splices.
 - 3. Erection: Install members plumb, level, and in a true plane.
 - 4. Fastenings: Make assembly rigid and secure, with welds free of voids and burnouts.
- B. Install metal framing systems in accordance with stud manufacturer's printed instructions.
- C. Runner Tracks:
 - 1. Install continuous tracks sized to match studs.
 - 2. Align tracks accurately to layout at base and tops of studs.
 - 3. Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches on center for nail or power-driven fasteners, nor 16 inches on center for other types of attachment.
 - 4. Provide fasteners at corners and ends of tracks.
 - 5. Tracks shall be anchored to structural steel prior to installing sprayed on insulation.
 - 6. Provide Deflection Track (DT), at top of stud walls at floor or roof above, typically. Allow for 1/2 inch movement of primary structure. Do not attach studs directly to Deflection Track.
 - 7. Vertical Deflection Clips: Provide manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure
- D. Secure studs to top track and bottom runner track by means of approved self-drilling screws or welding at both inside and outside flanges of 14 gauge or heavier material. Screws and welds shall be of sufficient size to insure strength of connection. All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structures."
- E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure. Use Zee clips as specified above. Weld "Z" shaped clips to structural members as shown on drawings. Maximum 2 feet on center vertical.

- G. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.
- H. Frame wall openings with extra studs, equal to the number of studs interrupted by wall openings, placed at each side of wall openings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with shoes or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.
- I. Install bracing/bridging in accordance with manufacturer's instructions and design conditions.
- J. Touch up field welds and damaged galvanized coating, except touch up of field cut studs is not required.
- K. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- L. Install horizontal stiffeners in stud system, space (vertical distance) at no more than 54 inches on center. Weld at each intersection.

END OF SECTION 05 40 00

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.
- D. Section 05 51 33 - Metal Ladders.
- E. Section 05 52 13 - Pipe and Tube Railings.
- F. Section 09 91 13 - Exterior Painting: Paint finish.
- G. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- G. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

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- I. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
 - J. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.
 - K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
 - L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
 - M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
 - N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
 - O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations for ceiling hung equipment supports.

1.05 QUALITY ASSURANCE

- A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Stainless Steel, General: ASTM A666, Type 304.

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- F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
 - G. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
 - H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
 - I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- C. Bolts, Nuts, and Washers: Stainless steel.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. The following is a list of principal items only. Refer to Drawings for items not specifically listed.
- B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- C. Joist Hangers: Strap anchors, fabricated with sheet steel, 18 gauge, 0.0478 inch minimum base metal thickness; galvanized finish.
- D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- E. Lintels: As detailed; prime paint finish.

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- F. Door Frames for Wall Openings: Channel sections; prime paint finish.
 - G. Metal bracing and supports for architectural woodwork; prime paint finish.
 - H. Above ceiling supports for ceiling hung equipment and special conditions; prime painted.
 - I. Masonry partition bracing; prime painted.

2.05 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
- B. Prime Painting: One coat.

2.06 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 50 00

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prefabricated ladders.

1.02 REFERENCE STANDARDS

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- B. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

2.02 PREFABRICATED LADDERS

- A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
 - 3. Finish: Mill finish aluminum.
 - 4. Manufacturers:
 - a. O'Keeffe's Inc; Model 500: www.okeeffes.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FINISHES - ALUMINUM

- A. Aluminum: Mill finish

2.04 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip aluminum where site welding is required.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 51 33

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Free-standing railings.
- C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- H. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017, with Amendment (2021).
- I. AWS C3.4M/C3.4 - Specification for Torch Brazing; 2016.
- J. AWS C3.5M/C3.5 - Specification for Induction Brazing; 2016, with Amendment (2017).
- K. AWS C3.9M/C3.9 - Specification for Resistance Brazing; 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

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- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
 - 1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
 - 2. Intermediate Rails: 1-1/2 inches diameter, round.
 - 3. Posts: 1-1/2 inches diameter, round.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.

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2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 - G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.
 - H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 1. Ease exposed edges to a small uniform radius.
 2. Welded Joints:
 - a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
 - b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
 3. Brass/Bronze Brazed Joints:
 - a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
 - b. Perform induction brazing in accordance with AWS C3.5M/C 3.5.
 - c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- D. Galvanizing: In accordance with requirements of ASTM A123/A123M.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:

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1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Weld connections that cannot be shop welded due to size limitations.
1. Weld in accordance with AWS D1.1/D1.1M.
 2. Match shop welding and bolting.
 3. Clean welds, bolted connections, and abraded areas.
 4. Touch up shop primer and factory-applied finishes.
 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 52 13

SECTION 05 73 16
WIRE ROPE DECORATIVE METAL RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Railings with horizontal stainless steel rod infill.

1.02 RELATED REQUIREMENTS

- A. Section 05 52 13 - Pipe and Tube Railings: Handrails other than those specified in this section.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023b.
- C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- E. ASTM A743/A743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application; 2021.
- F. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.
- G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- H. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- J. ASTM B247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings; 2020.
- K. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.
- L. ASTM E894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings; 1988 (Reapproved 2010).

- M. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- N. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- O. ASTM A480/A480M - Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Provide details and calculations for railing system, stamped by a Professional Structural Engineer.
- C. Samples: Metal finishes, two each type/finish, 3-inches by 5-inches.
- D. Design Data: Provide member structural and physical characteristics and engineering calculations, and identify dimensional limitations as prepared, sealed and signed by a structural engineer licensed in the State in which the Project is located.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cable Railing System:
 - 1. Hansen Architectural Systems, Inc: www.aluminumrailing.com
 - 2. Seco South, Inc.: www.secosouth.com.
 - 3. TriPyramid Structures, Inc.: www.tripyramid.com.
 - 4. Feeney Wire Rope & Rigging: www.feeneygateway.com.
 - 5. The Cable Connection: www.thecableconnection.com.
 - 6. Architectural Railings & Grilles: www.stainless-railings.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.
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2.02 MATERIALS

A. Stainless Steel

1. Castings: ASTM A743/A743M, Grade CF 8M
2. Wire Rope: ASTM A492, Type 316.
3. Plate and Sheet: ASTM A666, ASTM A480/A480M, Type 304.

B. Aluminum

1. Extruded Bar and Tube: ASTM B221, Alloy 6063-T5
2. Extruded Structural Pipe and Tube: ASTM B429/B429M, Alloy 6063-T832.
3. Drawn Seamless Tube: ASTM B210/B210M, Alloy 6061-T6.
4. Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6
5. Die and Hand Forgings: ASTM B247, Alloy 6061-T6
6. Castings: ASTM B26/B26M , Alloy A356-T6

2.03 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Design railing assembly, wall rails, and attachments to resist lateral force of 50 lbs at any point without damage or permanent set. Test in accordance with ASTM E935.
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for dimensions and configuration.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

2.04 RAILING COMPONENTS

A. Cable Railing System:

1. Basis of Design: Series 200X Cable Railing System by Hansen Architectural Systems, Inc.
 - a. Finish: Color Anodized: Bronze Matte

B. Top Rail: Round, 1-1/2 inch diameter, Aluminum.

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- C. Posts: Square, 2.37 inch by 2.37 inch with radiused corner.
 - D. Bottom Rail: Square, 1.69 inch by 1.67 inch with 0.76 inch wide pocket on top and an open bottom.
 - E. Condensation Insert: Rigid plastic post insert to evacuate water in hollow sections of railing members.
 - F. Cable Fittings: Stainless steel, Type 316; sizes to suit cable.
 - 1. Finish: Brushed.
 - 2. Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
 - G. Mounting Fittings: Manufacturer's standard, suitable for application.
 - H. Concealed Fasteners: Manufacturer's standard.

2.05 FINISH

- A. Color Anodized Finish: Class I, AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.

2.06 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- C. Provide anchors and plates required for connecting railings to structure.
- D. Fabricate with manufacturer's concealed mechanical fasteners and fittings, unless otherwise indicated.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- F. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
- G. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
- H. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

1. Close exposed end of cable railing system members with prefabricated fittings.
- I. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged.
 1. Fitting Attachments: Attach cable to fittings as follows:
 - a. Machine swaged with cold forming press.
 - b. Cable assembly sized to fit the cable.
 - c. Fork style connections at each end of the cable.
 2. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes.
 3. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- J. Form ornamental metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install railings according to ASTM E894 and ASTM E985.
- B. Install in accordance with manufacturer's instructions.
- C. Install components plumb and level, accurately fitted, free from distortion or defects.
- D. Anchor railings securely to structure.
- E. Adjust cable railing before anchoring to ensure alignment at abutting joint's space posts at interval indicated.
- F. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.05 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the cable railing systems shall be without damage at time of Substantial Completion.

END OF SECTION 05 73 16

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roofing nailers.
- B. Roofing cant strips.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.
- D. PS 1 - Structural Plywood; 2023.
- E. PS 20 - American Softwood Lumber Standard; 2021.
- F. SPIB (GR) - Standard Grading Rules; 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and construction adhesives.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

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- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
4. Fasteners for Interior Locations: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

-
- b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.06 CLEANING

A. Waste Disposal:

1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 10 00

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- C. Samples: Submit two samples of wood trim 6 inch long.
- D. Samples: Submit two samples of Base, full size, illustrating finish and construction.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:

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1. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 2. Provide designated labels on shop drawings as required by certification program.
 3. Provide designated labels on installed products as required by certification program.
 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Woodwork Items:
 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.02 LUMBER MATERIALS

- A. Softwood Lumber: Selected species, plain sawn, maximum moisture content of 6 percent; with flat grain, paint grade.
- B. Hardwood Lumber: Selected species, maximum moisture content of 6 percent; vertical grain, of quality suitable for transparent finish.

2.03 FASTENINGS

- A. Concealed Joint Fasteners: Threaded steel.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Redry wood after pressure treatment to maximum 12 percent moisture content.

2.06 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 20 00

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware.
- B. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 09 91 23 - Interior Painting: Field finishing of cabinet exterior.
- D. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- B. ANSI A208.1 - American National Standard for Particleboard; 2022.
- C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- D. ASTM A264 - Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate; 2012.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- F. ASTM F547 - Standard Terminology of Nails for Use with Wood and Wood-Base Materials; 2006.
- G. AWI (QCP) - Quality Certification Program; Current Edition.
- H. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- I. BHMA A156.9 - Cabinet Hardware; 2020.
- J. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.
- K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- L. PS 20 - American Softwood Lumber Standard; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide information as required by AWI/AWMAC/WI (AWS).
 - 3. Include certification program label.
- C. Product Data: Provide data for hardware accessories.
- D. Samples:
 - 1. Plastic laminate: Color/pattern, two, 12 x 12 inch.
 - 2. PVC edging: Two each color, 6 inch long.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 6. Replace, repair, or rework all work for which certification is refused.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

- B. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: As indicated on drawings.
3. Finish - Semi-Exposed Surfaces: As indicated on drawings
4. Finish - Concealed Surfaces: Manufacturer's option.
5. Door and Drawer Front Edge Profiles: Square edge with PVC edging.
6. Door and Drawer Front Retention Profiles: Fixed panel.
7. Casework Construction Type: Type A - Frameless.
8. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
9. Adjustable Shelf Loading: 50 psf.
10. Drawer Side Construction: Multiple-dovetailed.
11. Drawer Construction Technique: Dovetail joints.

- C. Shelving

1. Laminate Faced Shelves: Medium density fiberboard covered with high pressure decorative laminate on both sides.
 - a. Edge Finish: Hot melt PVC banding, same color; 1 mm thick.
 - b. Substrate Thickness: 3/4 inch, nominal.
 - c. Laminate: NEMA LD 3 Type HGL.

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- d. Laminate Color and Pattern: As scheduled.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

- A. Softwood Lumber: PS 20 Graded in accordance with AWI/AWMAC/WI (AWS), Grade I/Premium; moisture content of maximum 12 percent; species as recommended by manufacturer.

2.04 PANEL CORE MATERIALS

- A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
1. Grade: M-2; moisture resistance: MR10.
 2. Panel Thickness: As indicated on drawings.
- B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
1. Grade: 115; moisture resistance: MR10.
 2. Panel Thickness: As indicated on drawings.
 3. Use for painted components and concealed components.
 4. Use as backing for plastic laminate unless otherwise indicated.
- C. Moisture-Resistant Medium Density Fiberboard (MDF): ANSI A208.2, Grade 130MR50.
1. Premier Plus MR MDF manufactured by Flakeboard Company: www.flakeboard.com.
 2. Medex manufactured by Sierra Pine Composite Solutions: www.sierrapine.com.
- D. Basic Hardboard: Panel manufactured from inter-felted lignocellulosic fibers consolidated under heat and pressure; comply with ANSI A135.4.

2.05 HARDWOOD PLYWOOD PANELS

- A. Hardwood Plywood: Plywood manufactured for nonstructural decorative applications; consisting of faces and backs applied to a variety of core types; comply with HPVA HP-1.
1. Woodwork Quality Standard: Panels complying with specified woodwork quality standard.
 2. Wood Trim: Poplar; paint-grade; in profiles indicated on drawings.

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3. Veneer-Faced Panel Products: Species as indicated on drawings.
 - a. Thickness: 1/4 inch.
 4. Surface burning characteristics: Comply with ASTM E84, Class C.

2.06 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Provide specific types as indicated.
 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as indicated, finish as indicated.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as indicated, finish as indicated.
 3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as indicated, finish as indicated.
 4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- C. Low Pressure Laminate: Thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

2.07 COUNTERTOPS

- A. Countertops: See Section 12 36 00.

2.08 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 1. Color: Match component plastic laminate color.
 2. Thickness: 1mm and 3mm as indicated.
- C. Fasteners: Size and type to suit application.
- D. Nails: ASTM F547, size and type to suit application.
- E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; non-corrosive finish in concealed locations and stainless steel finish in exposed locations.

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- F. Concealed Joint Fasteners: Threaded steel.
 - G. Metal Inlays, Trim and Reveals: Stainless steel, ASTM A264, Type 304, commercial grade, minimum 16 gage, No.4. Refer to drawings for profiles.
 - H. Screw Caps: Snap-on plastic caps to conceal screw head. Color: White.
 - I. Grommets: Standard plastic grommets for cut-outs, in color as scheduled.

2.09 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, 1/4 inch diameter holes for nominal 2 inch spacing adjustments.
- C. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.
- D. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- E. Drawer and Door Pulls: Recessed, ligature resistant; where indicated.
- F. Sliding Door Pulls: Circular shape for recessed installation, steel with satin finish.
- G. Drawer Slides:
 - 1. Type: Extension types as indicated.
 - 2. Static Load Capacity: Commercial grade.
 - a. Pencil Drawer, 45 lb. load rating.
 - b. Box Drawer, 100 lb. load rating.
 - c. File Drawer, 200 lb. load rating.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Accuride International, Inc: www accuride.com/#sle.
 - b. Blum, Inc: www blum.com/#sle.

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- c. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com/#sle.
 - H. Hinges: European style concealed self-closing type, steel with polished finish.
 - 1. Capable of 3-way adjustment, 165-170 degree opening.
 - 2. Manufacturers:
 - a. Blum, Inc: www.blum.com/#sle.
 - b. Grass America Inc: www.grassusa.com/#sle.
 - c. Hafele America Co: www.hafele.com/us
 - d. Salice America, Inc: www.saliceamerica.com

2.10 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Use exposed fastening devices or nails only when unavoidable. Arrange neatly.
- E. Shelf Support Type: One of the following methods, Contractor's Option. Use specific method when indicated on drawings.
 - 1. Bored-hole and pin shelf support system.
 - 2. Metal standard and clip support system.
- F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with machine applied PVC edging of same color and pattern.
 - a. 1 mm thickness: Cabinet body edges.
 - b. 3 mm thickness: Cabinet door and drawer front edges. Countertop edges. Exposed shelf edges.

- G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions.
Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
 - 1. Install plastic screw caps to conceal screw heads at cabinet mounting fasteners.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 41 00

SECTION 06 61 16
SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid surfacing fabrications and trim, including:
 - 1. Wall base.
 - 2. Fixed seating
- B. Mounting system including adhesives, anchorages, shims, furring, fasteners, joint sealers, moldings, and masking (as required) for a complete installation.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework
- B. Section 12 36 00 - Countertops: Solid Surfacing Countertops

1.03 REFERENCE STANDARDS

- A. ANSI A136.1 - American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile; 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, fabrication profiles, fastening methods, cut-outs, jointing details, finishes and accessories; minimum scale 1-1/2 inch to 1 foot.
- C. Product Data
- D. Samples
 - 1. Color/finish: Two each type/color, 2 inches by 2 inches..
 - 2. Joint sealer color.
- E. Manufacturer's Printed Installation Instructions

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- F. Operation and Maintenance Data: Two copies of maintenance instructions. Include manufacturers recommended cleaning materials and application methods, and precautions in use of cleaning materials that may be detrimental to surfaces if improperly applied.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with minimum 5 years experience in manufacture of specified items on projects of similar size.
 - 1. Furnish a list of at least five other jobs of similar size, indicating how long installed, and architect's name.
- B. Fabricator Qualifications: Firm with minimum 5 years experience in fabrication and installation of solid surfacing on projects of similar size.
 - 1. Assume responsibility for solid surfacing fabrications including attachment to sub-construction, panel-to-panel joints, panel-to-dissimilar material joints, and system joint seals.

1.06 MOCK-UP

- A. Construct mock-up, 10 feet long by 10 feet wide minimum, illustrating full panel sheet, edge trim, joint trim .
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials undamaged.
- B. Coordinate delivery with scheduled installation date to allow minimum storage time at site.
- C. Store materials in clean, dry location. Protect from soiling, abuse and moisture. Follow manufacturer's instructions.

1.08 PROJECT CONDITIONS

- A. Verify existing conditions and substrates before starting Work. Correct unsatisfactory conditions before proceeding.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warrant the Work of this Section for one year to be free of defects in materials or workmanship as indicated by the following.
 - 1. Loosening of fabrication or trim.

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2. Visible warpage of fabrication.
 3. Delamination of sheet faces.
- C. Provide ten year manufacturer warranty for solid surfacing material.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. DuPont Company, Product Corian: www2.dupont.com.
- B. Wilsonart International, Product Gibraltar: www.wilsonart.com.
- C. CaesarStone Quartz Surfacing: www.caesarstoneus.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Flame Spread (ASTM E84): Class A.
- B. Tolerances of Erected Work: Maximum deviation from vertical and horizontal alignment: 1/4 inch in 20 feet non-cumulative.

2.03 MANUFACTURED UNITS

- A. Solid Surfacing Fabrications:
 1. Solid Surfacing Sheet: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Physical Properties: Meet or exceed manufacturer's published properties.
 - b. Flat Sheet Thickness: 1/2 inch, minimum.

2.04 ACCESSORIES

- A. Joint Adhesive: Manufacturer's standard two-part type, joining by means of chemical bond.
- B. Sheet Adhesive: Manufacturer's standard neoprene-based type; ANSI A136.1.
- C. Joint Sealer: Silicone, Section 07 92 00 - Joint Sealants, colors as selected to match solid polymer fabrications.

2.05 SOLID SURFACING FABRICATIONS

- A. Fabrication Tolerances

-
1. Sheet Flatness: Maximum deviation in sheet flatness in any direction shall not exceed 0.6 percent of the assembled units (non-cumulative). Provide surfaces free from warp and buckle.
 2. Sheet Dimensions: Perform fabrication under controlled shop conditions. Field fabrication will be allowed where absolutely necessary, but kept to a minimum.
 3. Provide sharp, true sheet lines, breaks, and angles.

B. Fabrication

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Do not use visible fasteners, or allow telegraphing or fastening on sheet faces.
3. Fabricate components to dimension, size, and profile indicated on the Drawings based on a design temperature of 70 degree Fahrenheit.
4. Fabricate components so that no restraints can be placed on the item that might result in compressive skin stresses. Detailing shall be such that component remain flat regardless of temperature changes.
5. Leave protection sheet in place during fabrication, shipping, and erection.
6. Form joints between fabrications using joint adhesive. Joints shall be inconspicuous in appearance, without voids.
7. Provide accurate holes and cutouts for plumbing fittings, electrical devices and other accessories.
8. Rout and finish component edges to smooth, uniform finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Ensure substrates to receive fabrications are clean, true and free of irregularities. Inspect surfaces before commencing Work, report defects.
- B. Ensure substrate is acceptable to receive fabrications.

3.02 PREPARATION

- A. Schedule component installation as late as possible to prevent damage during construction.

3.03 INSTALLATION

- A. Install fabrications according to manufacturer's printed instructions. Erect items plum, level, and true.
- B. Anchor fabrications securely in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- C. Do not install defective fabrication parts, such as warped, bowed, dented, abraded, or broken members.
- D. Do not cut or trim fabrication parts during erection in a manner which would damage finish, decrease strength, or result in a visual imperfection or failure in performance. Return fabrication parts that require alteration to shop for refabrication, if possible, or for replacement for new parts.
- E. Miter edge molding intersections. Butt square edged molding joints.
- F. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
- G. Vertical surfaces with silicone sealant joints:
 - 1. 1/4-inch-thick solid surface material, with 1/8-inch-wide joints, sealed with manufacturer's color-matching silicone sealant; adhesively applied to solid substrates with matching color.
- H. Vertical surfaces with hard seams:
 - 1. 1/4 inch thick, with butt joints between sheets made with manufacturer's joint adhesive matching color of solid polymer material; adhesively applied to solid substrates; 1/8 inch expansion joints filled with color-matching silicone every 10 to 15 feet with matching color.
- I. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- J. Seal penetration joints with joint sealer according to requirements of Section 07 92 00 - Joint Sealants.

3.04 ADJUSTING AND CLEANING

- A. Remove and replace fabrications that are damaged beyond repair.
- B. Repair fabrications exhibiting minor damage.
- C. Remove protection sheet from finish faces as soon as possible after installation.
- D. Remove adhesive, sealant and debris from finish surfaces.
- E. Remove debris and leave areas neat and clean.

3.05 PROTECTION

- A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION 06 61 16

SECTION 07 19 00
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to exterior, masonry and concrete surfaces.

1.02 REFERENCE STANDARDS

- A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.
- B. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.
- C. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2022).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience

1.06 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
 - 1. BASF Construction Chemicals: www.buildingsystems.basf.com/#sle.
 - 2. Drylok: www.drylok.com
 - 3. Pecora Corporation: www.pecora.com/#sle.
 - 4. PROSOCO, Inc: www.prosoco.com/#sle.
 - 5. Tnemec Company, Inc: www.tnemec.com/#sle.

2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Protection of Adjacent Work:
 - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 - 2. Protect adjacent surfaces not intended to receive water repellent.

- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Remove loose particles and foreign matter.
- D. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- E. Scrub and rinse surfaces with water and let dry.
- F. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION 07 19 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at locations indicated.
- B. Batt insulation in exterior wall and ceiling construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Separate weater barrier materials.
- B. Section 07 54 00 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

1.03 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on installation techniques.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Evaluated Materials Program (EAP); www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
 - 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
 - 2. Products:
 - a. Atlas Roofing Corporation: www.atlasroofing.com/#sle.
 - b. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/#sle.
 - c. GAF: www.gaf.com/#sle.
 - d. Johns Manville: www.jm.com/#sle.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

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3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 4. Thermal Resistance: As indicated on drawings.
 5. Facing: Asphalt treated Kraft paper, one side.
 6. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
- B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Thermal Resistance: As indicated on drawings.
 4. Products:
 - a. Johns Manville: www.jm.com/#sle.
 - b. Knauf Insulation: www.knaufinsulation.com/#sle.
 - c. ROCKWOOL (ROXUL, Inc): www.rockwool.com/#sle.
 - d. Thermafiber, Inc: www.thermafiber.com/#sle.

2.03 ACCESSORIES

- A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
 1. Products:
- B. Insulation Fasteners: Appropriate for purpose intended.
 1. Length as required for thickness of insulation material and penetration of deck substrate.
- C. Wire Mesh: Galvanized steel, hexagonal wire mesh.
- D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Retain insulation batts in place with wire mesh secured to framing members.
- F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 21 00

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.
- B. Section 09 24 00 - Cement Plastering: Water-resistive barrier under portland cement plaster.

1.03 DEFINITIONS

- A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.04 REFERENCE STANDARDS

- A. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2023a.
- B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- D. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015, with Editorial Revision (2020).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIER MATERIALS

- A. Water-Resistive Barrier Coating: Fluid-applied air and water-resistive coating for various exterior substrates.
 - 1. Air Permeance, Building Assembly Air Leakage Rate: Not greater than 0.04 cfm/sq ft when tested at 1.57 psf in accordance with ASTM E2357.
 - 2. Air Permeance, Building Material Air Leakage Rate: 0.004 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in accordance with ASTM E2178.
 - 3. Water-Resistive Barrier over Sheathing Compliance: Complying with ICC-ES AC212.
 - 4. Water Vapor Permeance: Tested in accordance with ASTM E96/E96M.
 - a. Procedure A: Greater than 5 perms.
 - b. Procedure B: Greater than 14 perms.
 - 5. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
 - 6. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
 - 7. System Accessory Products: As recommended by coating manufacturer.
 - 8. Products:
 - a. PROSOCO, Inc: www.prosoco.com/#sle.
 - b. Siplast: www.siplast.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.
- B. Primer: Liquid applied polymer as recommended by weather barrier manufacturer.

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- C. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable liquid flashing.
 - D. Stainless Steel Flashing: Flexible flashing with 2 mil, 0.002 inch thick Type 304 stainless steel sheet, 8 mil, 0.008 inch of butyl adhesive and siliconized release liner.
 - 1. Width: 4 inches wide.
 - E. Thinners and Cleaners: As recommended by water-resistive barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Coatings:
 - 1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 - 2. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.
- E. Openings and Penetrations in Exterior Water-Resistive Barriers:
 - 1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.

3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07 25 00

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal roof panel system of preformed aluminum panels.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Rigid roof insulation.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.
- C. Section 10 73 26 - Walkway Coverings: Pre-Engineered canopies.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- G. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).
- H. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2018).
- I. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems; 2016 (Reapproved 2022).
- J. TDI - Texas Revisions to the 2018 International Building Code; 2020.

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- K. TDI (PED) - Product Evaluation Directory - Texas Department of Insurance; Current Edition.
 - L. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
 - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
- D. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 FIELD CONDITIONS

- A. Do not install metal roof panels, underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or

flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Metal Roof Panel Manufacturers:

1. ATAS International, Inc: www.atas.com/#sle.
2. Berridge Manufacturing Company; Tee-Lock Panel: www.berridge.com/#sle.
3. Kingspan: www.kingspan.com
4. MBCI: www.mbc.com/#sle.
5. Morin Corporation: www.morincorp.com/#sle.
6. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
7. Sheffield Metals International: www.sheffieldmetals.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:

1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
4. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
5. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
6. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.
7. Meet TDI requirements
8. TDI (PED) approved.

2.03 METAL ROOF PANELS

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Aluminum Panels:
 - a. Alloy and Temper: Aluminum complying with ASTM B209/B209M; temper as required for forming.
 - b. Thickness: Minimum 22 gauge, 0.032 inch.
 - 2. Profile: Batten seam, with separate snap-on battens of same metal as panels; concealed fastener system.
 - 3. Texture: Smooth.
 - 4. Width: Maximum panel coverage of 18 inches.
- C. Metal Soffit Panels:
 - 1. Profile: Style as indicated, with venting provided.
 - 2. Material: Precoated aluminum sheet, 24 gauge, 0.020 inch minimum thickness.
 - 3. Color: As indicated.

2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 FABRICATION

- A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.06 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent

PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as scheduled.

2.07 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
 - 3. Seam Sealant: Factory-applied, non-skinning, non-drying type.
- D. Thermal Insulation: Provide rigid type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame spread index of 50, per ASTM E84; for installation using spacer blocks.
 - 1. Thickness: As required to meet required thermal resistance.
- E. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
 - 1. Self Sealability: Nail sealability in accordance with ASTM D1970/D1970M.
 - 2. Low Temperature Flexibility: Comply with ASTM D1970/D1970M.
 - 3. Water Vapor Permeance: 1 perm, maximum, when tested in accordance with ASTM E96/E96M, Desiccant Method A.
 - 4. Performance: Comply with ASTM D226/D226M, Type II asphalt-saturated organic felt.
 - 5. Fasteners: As specified by manufacturer and building code qualification report or approval.
- F. Fasteners: Corrosion resistant.
 - 1. For attachment to roof deck: 16 gauge stainless steel, Type 316 with one-piece, low Tee-lock clips place over 6"x6" 24 gauge steel bearing plate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.
- B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- D. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
 - 1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.

- 2. Provide concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
- D. Insulation: Install insulation between roof covering and supporting members to present a neat appearance; fold, staple, and tape seams unless otherwise approved by Architect.

3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 07 41 13

SECTION 07 42 13.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.
- B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Installation of anchors.
- B. Section 07 25 00 - Weather Barriers: Water-resistive barrier behind wall panel system.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- E. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).
- F. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014

(Reapproved 2021).

- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- K. TDI Windstorm - Texas Revisions to the 2018 International Building Code; 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 - 2. Storage and handling requirements and recommendations.
 - 3. Fabrication instructions and recommendations.
 - 4. Specimen warranty for finish, as specified herein.
- C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
 - 4. Specimen warranty for wall system, as specified herein.
- D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
 - 1. Indicate panel numbering system.
 - 2. Differentiate between shop and field fabrication.
 - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
 - 4. Include large-scale details of anchorages and connecting elements.
 - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

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- E. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
 - F. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
 - G. Testing agency's qualification statement.
 - H. Maintenance Data: Care of finishes and warranty requirements.

1.05 QUALITY ASSURANCE

- A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect finishes by applying heavy-duty removable plastic film during production.
 - 2. Package for protection against transportation damage.
 - 3. Provide markings to identify components consistently with drawings.
 - 4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in well-ventilated space out of direct sunlight.
 - 2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
 - 3. Store at a slope to ensure positive drainage of accumulated water.
 - 4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
 - 5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Composite Material (MCM) Sheet Manufacturers:
 - 1. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS FaceFastened System: www.alucobondusa.com/#sle.
 - 2. ALPOLIC Materials: www.alpolic-americas.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.
 - 1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
 - 2. Provide panel jointing and weatherseal using a "wet", sealant-sealed system.
 - 3. Anchor panels to supporting framing without exposed fasteners.

2.03 PERFORMANCE REQUIREMENTS

- A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
 - 1. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
 - 2. Design Wind Pressure: In accordance with local building code.
 - 3. Inward Design Wind Pressure: ___ psf.

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4. Outward Design Wind Pressure: ____ psf.
 5. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
 6. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
- B. Air Leakage: 0.10 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.
- C. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.27 psf minimum, after 15 minutes.
1. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
 2. Design to drain leakage and condensation to the exterior face of the wall.
- D. Meet TDI Windstorm requirements.

2.04 MATERIALS

- A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
1. Overall Sheet Thickness: 0.157 inch, minimum.
 2. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
 3. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 4. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.
- B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
 2. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

2.05 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

2.06 ACCESSORIES

- A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; see Section 07 62 00 for additional requirements.
- B. Fasteners:
 - 1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
 - 2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
 - 3. Bolts: Stainless steel.
 - 4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine dimensions, tolerances, and interfaces with other work.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
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- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Where joints are designed for field-applied sealant, seal joints completely with specified sealant.
- H. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.
- I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
 - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
- J. Replace damaged products.

3.04 CLEANING

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

3.05 PROTECTION

- A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION 07 42 13.23

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber-cement siding.

1.02 REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- G. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.
- C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.06 FIELD CONDITIONS

- A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

- A. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Simulated wood grain.
 - 2. Length (Height): 18 inches, nominal.
 - 3. Width: 72 inches.
 - 4. Thickness: 5/8 inch, nominal.
 - 5. Finish: Factory applied stain.
 - 6. Color: As indicated on drawings.
 - 7. Warranty: 30 year limited; transferable.
 - 8. Products:
 - a. Allura, a division of Plycem USA, Inc: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc: www.jameshardie.com/#sle.

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- c. Nichiha USA, Inc; Vintagewood: www.nichiha.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Do not begin until unacceptable conditions have been corrected.
- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.03 INSTALLATION

- A. Install siding in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Use trim details as indicated on drawings.
 - 3. Touch up field cut edges before installing.
 - 4. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Steel Studs: Use hot-dipped galvanized self-tapping screws, with the points of at least three screws penetrating each stud the panel crosses and at panel ends.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- E. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

- F. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- G. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean faced panels in accordance with manufacturer's maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 46 46

SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, tapered.
- C. Deck sheathing.
- D. Cover boards.
- E. Flashings.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood cant strips.
- B. Section 07 71 00 - Roof Specialties: Prefabricated roofing expansion joint flashing.

1.03 REFERENCE STANDARDS

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.
- D. ASTM D7877 - Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes; 2014.
- E. ASTM D8231 - Standard Practice for the Use of a Low Voltage Electronic Scanning System for Detecting and Locating Breaches in Roofing and Waterproofing Membranes; 2019.
- F. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).
- G. NRCA (RM) - The NRCA Roofing Manual; 2023.
- H. NRCA (WM) - The NRCA Waterproofing Manual; 2021.
- I. TDI - Texas Revisions to the 2018 International Building Code; 2020.
- J. TDI (PED) - Product Evaluation Directory - Texas Department of Insurance; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- E. Testing firm's qualification statement.
- F. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.06 QUALITY ASSURANCE

- A. Testing Firm Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.

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- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above ____ degrees F.
 - C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
 - D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
 - E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle SynTec Systems; Sure-Weld TPO: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC; UltraPly TPO: www.firestonebpco.com.
 - 3. GAF; EverGuard TPO: www.gaf.com/#sle.
 - 4. Johns Manville: www.jm.com/#sle.
 - 5. Versico Roofing Systems; VersiWeld TPO: www.versico.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.

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- a. Calculate SRI in accordance with ASTM E1980.
 - b. Field applied coating may not be used to achieve specified SRI.
 2. Meet TDI requirements
 3. TDI (PED) approved.
 - C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
 1. Minimum 2 layers of polyisocyanurate board.
 2. Bottom layer of polyisocyanurate board covered with single layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
 - D. Acceptable Insulation Types - Tapered Application: Any of types specified.
 1. Tapered polyisocyanurate board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
 - a. Thickness: 80 mil, 0.080 inch, minimum.
 2. Sheet Width: Factory fabricated into widest possible sheets.
 - a. Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

- A. Deck Sheathing: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
 1. Products:
 - a. Georgia-Pacific; DensDeck or DensDeck Prime: www.densdeck.com/#sle.

2.05 COVER BOARDS

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.

1. Products:
 - a. Georgia-Pacific; DensDeck or DensDeck Prime: www.densdeck.com/#sle.

2.06 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.

1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2, 20 psi (138 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F.
2. Board Edges: Square.

2.07 ACCESSORIES

- A. Prefabricated Roofing Expansion Joint Flashing: See Section 07 71 00.
- B. Cant Strips: Wood, pressure preservative treated; see Section 06 10 00.
- C. Sheathing Joint Tape: Paper type, _____ inches wide, self adhering.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
- F. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- G. Insulation Adhesive: As recommended by insulation manufacturer.
- H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 1. Composition: Asphaltic with mineral granule surface.
 2. Size: 18 by 18 inches.
 3. Surface Color: White or Yellow.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION - METAL DECK

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
 - 4. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions and TDI Windstorm requirements.
 - a. Over entire roof area, fasten sheathing using eight fasteners with washers per sheathing board.

3.03 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 INSTALLATION - INSULATION, UNDER MEMBRANE

- A. Attachment of Insulation:
 - 1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and TDI Windstorm requirements.
- B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and TDI Windstorm requirements.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. Do not install more insulation than can be covered with membrane in same day.

3.05 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate of ___ gallons per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Install roofing expansion joints where indicated. Make joints watertight.
 - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- H. Coordinate installation of roof drains and sumps and related flashings.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements.
- C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.
- D. Electronic Leak Detection (ELD) Testing: Test roofing areas for leaks using ELD method that locates discontinuities in membrane roofing in accordance with ASTM D7877 or ASTM D8231.
 - 1. Testing agency to submit Daily Field Report (DFR) in accordance with ASTM D8231 indicating daily details of work performed.
 - 2. Testing agency to submit training certification to ensure that technician performing ELD testing is currently certified in accordance with relevant training program.

3.07 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 54 00

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
- B. Pre-Finished Aluminum: ASTM B209/B209M; 20 gauge, 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
 - 1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.
- C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 3 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer Type: Zinc chromate.

- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.
- B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 62 00

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings.
- B. Roof control and expansion joint covers.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. NRCA (RM) - The NRCA Roofing Manual; 2023.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of coping.
- E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. Architectural Products Co: www.archprod.com/#sle.
 - 2. ATAS International, Inc: www.atas.com/#sle.
 - 3. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 4. Metal Roofing Systems, Inc: www.metalroofingsystems.biz/#sle.

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5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Control and Expansion Joint Covers:
- C. Specialty Penetration Flashings:
1. York Manufacturing, Inc.: www.yorkmfg.com.
 2. Roof Products & Systems Corp.: www.rpscurbs.com.
 3. Portals Plus, Inc.: www.portalsplus.com.
 4. Pate Company: www.patecurbs.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Copings: Factory fabricated to sizes required; corners mitered and welded; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 3. Wall Width: As indicated on drawings.
 4. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
 5. Finish: 70 percent polyvinylidene fluoride.
 6. Color: Custom color to match Architect's sample.
- B. Control and Expansion Joint Covers: Composite construction of ____-inch wide flexible EPDM flashing of white color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.
- C. Specialty Penetration Flashings: Preformed EPDM pipe and penetration seals designed for waterproof seal of individual, and clustered, roof penetrations.
1. Provide size and configuration required by each specific condition to provide maximum height above roof surface to the stainless steel clamping ring.
 2. Where a preformed flashing boot will not slide over a penetrating item, provide "Retrofit Flashing" by Portals Plus Inc. designed to wrap around the item and closed with a weatherproof seal.

3. Where a metal base is required by the roofing membrane manufacturer for tie-in to the roof membrane, provide one of the following:
 - a. Alumi-Flash System manufactured by Portals Plus Inc.
 - b. Alumi Flash manufactured by Roof Products & Systems Corp.

2.03 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; custom color to match approved sample.

2.04 ACCESSORIES

- A. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- F. Provide weathertight installation.

END OF SECTION 07 71 00

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof hatches.

1.02 RELATED REQUIREMENTS

- A. Section 07 71 00 - Roof Specialties: Other manufactured roof specialty items.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for defects in material and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ROOF HATCHES

- A. Roof Hatch Manufacturers:
1. Acudor Products Inc: www.acudor.com/#sle.
 2. Babcock-Davis: www.babcockdavis.com/#sle.
 3. Bilco Company: www.bilco.com/#sle.
 4. Nystrom, Inc: www.nystrom.com/#sle.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.
 2. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.
 3. Thermally Broken Hatches: Provide insulation within frame and cover.
 4. For Ladder Access: Single leaf; 30 by 36 inches.
 5. Product: Type S Roof Hatch manufactured by Bilco
- C. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
 2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
 3. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
 4. Gasket: EPDM, continuous around cover perimeter.
- D. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
 2. Hinges: Heavy duty pintle type.
 3. Hold open arm with vinyl-coated handle for manual release.
 4. Latch: Upon closing, engage latch automatically and reset manual release.

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5. Manual Release: Pull handle on interior.
 6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 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.
- C. See Section 07 71 00 for information on roof specialties.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 72 00

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).
- C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023a.
- F. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023.
- G. ITS (DIR) - Directory of Listed Products; Current Edition.
- H. FM (AG) - FM Approval Guide; Current Edition.
- I. {RSTEMP#10008088}
- J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- K. UL (DIR) - Online Certifications Directory; Current Edition.
- L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Furnish a single submittal package, coordinated and complete, covering Work of all trades and all conditions requiring firestopping. Multiple submittals are not acceptable.
- C. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- D. Product Data: Provide data on product characteristics.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Certificate from authority having jurisdiction indicating approval of materials used.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.
- J. Field Quality Control Submittals: Indicate results of installation inspection.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. Hilti, Inc: www.us.hilti.com/#sle.
 - 3. Nelson FireStop Products: www.nelsonfirestop.com.
 - 4. Specified Technologies Inc: www.stifirestop.com/#sle.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Safing Clips: Z-shaped galvanized steel clips formed from 1 inch wide strips of 20 gauge galvanized steel. 3 inches high with 2 inch and 3 inch upper and lower horizontal legs.
- D. Backer Bar Assembly: Galvanized sheet steel channels, angles and fasteners in sizes and gauges as required by UL Time-Design assembly rating.
- E. Curtain Wall Insulation Hanger System: Sheet steel hangers and accessory hardware for attaching curtain wall insulation.
 - 1. Product: Impasse System manufactured by Thermafiber: www.thermafiber.com.
- F. Backer / Reinforcement Member: Light gauge steel channel or angle approved by primary manufacturer. Place horizontally at the safe-off line to support the curtain wall insulation to prevent bowing of curtain wall insulation caused by compression fitting of the Safing insulation.
 - 1. Product: Impasse T-Bar manufactured by Thermafiber: www.thermafiber.com.
- G. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.

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3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.
- B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- D. Membrane Penetration Firestopping: Use system that has been tested according to ASTM E814 or {RS#10008088} to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated, with a minimum positive pressure differential of 0.01 inch od water.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- E. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
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4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.04 SAFING INSULATION

- A. Install Safing insulation of proper density and size into poke-throughs and penetrations as prescribed by the listed and tested assembly.
- B. Install safing insulation between rated partition heads and metal decking.

3.05 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.06 IDENTIFICATION

- A. Location: Permanently identify surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop

systems.

B. Label: Pressure sensitive self-adhesive vinyl labels, with the following minimum information:

1. The words "Warning - Through Penetration Firestop System - Do not Disturb. Notify Building Management of Any Damage."
2. Listing agency's system number or designation.
3. System manufacturer's name, product name/number.
4. Installer's name.
5. General contractor's name.
6. Date of installation.

3.07 REPAIR

A. Perform under this Section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.08 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.09 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 84 00

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
- H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).
- I. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

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1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 2. List of backing materials approved for use with the specific product.
 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 4. Substrates the product should not be used on.
 5. Substrates for which use of primer is required.
 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
- C. Schedule: Submit tabulation indicating sealant types, manufacturer, product, location and color.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- F. Installation Plan: Submit at least four weeks prior to start of installation.
- G. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- I. Installation Log: Submit filled-out log for each length or instance of sealant installed.
- J. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- K. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.
- L. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

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- C. Installation Plan: Include schedule of sealed joints, including the following:
1. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Location on project.
 - b. Substrates.
 - c. Sealant used.
 - d. Date of installation.
 - e. Name of installer.
 - f. Actual joint width; provide space to indicate maximum and minimum width.
 - g. Actual joint depth to face of backing material at centerline of joint.
 - h. Air temperature.
- D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Test method used.
 - g. Date of installation of field sample to be tested.
 - h. Date of test.
 - i. Copy of test method documents.
 - j. Age of sealant upon date of testing.
 - k. Test results, modeled after the sample form in the test method document.
 - l. Indicate use of photographic record of test.
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E. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

F. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANTS - GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.02 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Applications: Use for:
 - a. Exterior joints between metal panels.
 - b. Control, expansion, and soft joints in concrete.
 - c. Joints between metal frames and other materials.

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- d. Interior perimeter joints of metal frames in exterior walls.
 - e. Interior joints between countertops, backsplashes and wall surfaces.
 - f. Other exterior joints for which no other sealant is indicated.
2. Movement Capability: Plus and minus 50 percent, minimum.
 3. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 4. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 5. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 6. Color: Match adjacent finished surfaces.
 7. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/#sle.
 - c. Sika Corporation; Sikasil WS-290: www.usa.sika.com/#sle.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Applications:
 - a. Joints between plumbing fixtures and wall surfaces
 2. Color: White.
 3. Products:
 - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - b. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
- C. Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
 2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.
 3. Color: Match adjacent finished surfaces.

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- D. Tamper-Resistant Sealant: One-part, hard-setting, pick-proof sealant.
1. Hardness Range: 70-80, Shore A, when tested in accordance with TT-S-00230C.
 2. Tensile Strength: 2000 psi, when tested in accordance with ASTM D412.
 3. Color: Match adjacent finished surfaces.
 4. Products:
 - a. Surebond; SB-190 Everseal: www.surebond.com.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Applications:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
 2. Color: Standard colors matching finished surfaces, Type OP (opaque).
 3. Grade: ASTM C834; Grade NF.
 4. Products:
 - a. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 - b. Pecora Corporation: www.pecora.com/#sle.
 - c. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Sealant Backing Rod, Closed-Cell Type:
1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
 2. Size: 25 to 50 percent larger in diameter than joint width.
- B. Sealant Backing Rod, Open-Cell Type:
1. Cylindrical flexible sealant backings complying with ASTM C1330 Type O.

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2. Size: 25 to 50 percent larger in diameter than joint width.
- C. Sealant Backing Rod, Bi-Cellular Type:
1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 2. Size: 25 to 50 percent larger in diameter than joint width.
- D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION 07 92 00

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion joint cover assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 07 54 00 - Thermoplastic Membrane Roofing
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board control joint trim.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.
- D. Section 09 24 00 - Cement Plastering

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.
- D. ASTM E1612/E1612M - Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures; 1994 (Change 1, 2013).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Expansion Joint Cover Assemblies:
 - 1. Balco, Inc: www.balcousa.com/#sle.
 - 2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 3. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
 - 4. Inpro; ____: www.inprocorp.com/#sle.
 - 5. MM Systems Corp: www.mmsystemscorp.com/#sle.
 - 6. Nystrom, Inc: www.nystrom.com/#sle.
 - 7. Watson Bowman Acme Corporation: www.watsonbowmanacme.com/#sle.

2.02 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Joint Cover Styles: As indicated on drawings.
 - 4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.
- C. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.
- D. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

2.03 PREFORMED COMPRESSIBLE EXPANSION JOINT SEAL

- A. Flexible profile manufactured from open-cell polyether urethane foam with a factory applied elastomeric silicone membrane coating designed to provide protection against moisture and water intrusion on vertical surfaces.
 - 1. Profile capable of providing a minimum of plus or minus 25 percent building movement and accommodate moderate variations in width of opening, complex directional change transitions and resist ultraviolet degradation.
 - 2. Coated on one side with pressure-sensitive adhesive and covered with protective wrapping
 - 3. Profile installed without use of field applied adhesives or invasive anchor systems.
 - 4. 100 percent free of wax or asphalt compounds.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
 - 1. Exposed Finish at Walls and Ceilings: Natural anodized.
- B. Resilient Seals:
 - 1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
 - 2. For Ceilings: Neoprene or Santoprene resilient material, flush, pleated, or hollow gasket; Shore A hardness of 40 to 75 Durometer.
 - 3. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
- C. Compression Seals: ASTM E1612/E1612M preformed elastomeric extrusions.
- D. Anchors and Fasteners: As recommended by cover manufacturer.
- E. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

2.05 ACCESSORIES

- A. Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.
- B. Provide strippable coating to protect finish surface.

END OF SECTION 07 95 13

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- H. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. ITS (DIR) - Directory of Listed Products; Current Edition.
- K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

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- L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
 - M. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
 - N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
 - O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
 - P. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
 - Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
 - R. UL (DIR) - Online Certifications Directory; Current Edition.
 - S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.

- #### B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements

conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches, nominal.
- C. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches, nominal.
- D. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.

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2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
 4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 5. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 3. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- E. Door Frames, Fire-Rated: Full profile/continuously welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 - 1. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
 - 2. Metal Finish: Gray polyester powder coating.
- B. Glazing: As specified in Section 08 80 00, factory installed.
- C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 71 00.
- E. Comply with glazing installation requirements of Section 08 80 00.
- F. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 08 11 13

SECTION 08 14 23.23
THERMOPLASTIC CLAD WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermoplastic Clad Interior Wood Doors.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants : Silicone joint sealant.
- B. Section 08 71 00 - Door Hardware : Door hardware.
- C. Section 09 91 23 - Interior Painting: Field finishing.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ASTM D4226 - Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products; 2016.
- C. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.
- C. Test Reports: Show compliance with specified criteria.

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- D. Shop Drawings: Show layout and profiles; include assembly methods.
 - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 - 2. Indicate wall conditions, door and frame elevations, sections, materials, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings.
 - E. Verification Samples: Submit door surface samples for each finish specified, 10 inch by 10 inch in size, illustrating finishes, colors, and textures.
 - F. Door Corner Sample: Submit corner cross sections, 12 inch by 12 inch in size, illustrating construction, finish, color, and texture.
 - G. Maintenance Data: Include instructions for repair of minor scratches and damage.
 - H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than three years of documented experience.
- C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Mark doors with location of installation, door type, color, and weight.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Polyvinyl or plastic wrap doors.
- C. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
 - 1. Store at temperature and humidity conditions recommended by manufacturer.
 - 2. Do not use non-vented plastic or canvas shelters.
 - 3. Immediately remove wet wrappers.
- D. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inches space between doors.

1.07 PROJECT CONDITIONS

- A. Obtain hardware manufacturer's templates prior to starting fabrication.
- B. Do not install doors until structure is enclosed.
- C. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
 - 1. Include coverage for warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Construction Specialties, Inc.: www.c-sgroup.com.

2.02 MATERIALS

- A. PVC-Free Thermoplastic: Extruded thermoplastic material with suede texture.
 - 1. Flame Spread Rating (ASTM E84): Class A.
 - 2. Chemical and Stain Resistance: ASTM D543.
 - 3. Impact Resistance (ASTM D4226): 86 in/lb. minimum.
- B. Facing Adhesive: Type I - waterproof. For fire rated doors, provide same adhesive as that used in fire test.

2.03 MANUFACTURED UNITS

- A. Flush Thermoplastic Clad Interior Doors: 1-3/4 inches thick; 5-ply construction with hardboard skins and solid core with plastic sheet 0.040 inch thick faces; WDMA I.S. 1A.
 - 1. Stiles: Replaceable solid hardwood stiles and replaceable edging with minimum 1/4 inch radius as selected.
 - 2. Door Edges: Thermoplastic solid color sheet 0.060 inch thick.
 - 3. Edge Seals: Concealed intumescent seals.

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4. Non-Rated Solid Core Doors: ANSI A208.1, Grade LD-1 particleboard core (PC), plies and faces as indicated above.
 5. Fire Rated Cores:
 - a. 20 Minute UL Label: ANSI A208.1, Grade LD-1 particle board 32 lb/CF average density.
 - b. 45 and 60 minute UL Label: Solid mineral.
 6. Color: As selected.

2.04 FIRE RATED ASSEMBLIES

- A. Comply with NFPA 80.
- B. Where scheduled, provide fire-rated doors, frames, fasteners and hardware tested as an assembly. Identify fire-rated doors with UL testing laboratory label indicating applicable fire rating for doors within NFPA and UL size limitations.
- C. Permanently fasten UL labels to fire-rated doors and frames.
- D. Doors at Fire-stair Enclosures: Maximum transmitted temperature end point shall not exceed 450 degrees F above ambient at end of 30 minutes of the fire exposure specified in UL 10C and NFPA 252.

2.05 FABRICATION

- A. Fabricate standard type doors in accordance with requirements of WDMA I.S. 1A.
- B. Fabricate fire-rated doors in accordance with requirements of WDMA I.S. 1A and Underwriters' Laboratories (UL).
- C. Cores Constructed with Stiles and Rails:
 1. Top Rails: 5 inch wide solid hardwood stock.
 2. Bottom Rails: 5 inch wide solid hardwood stock where concealed door seal or kick plate is scheduled.
- D. Provide solid hardwood blocks at lock edge for hardware reinforcement.
 1. Provide solid hardwood blocking for other throughbolted hardware.
 2. Intermediate Blocking: 5 inch solid hardwood stock where exit devices are scheduled.
- E. Provide doors with minimum 1-1/4 inch thick integral bonded hardwood edge strips, fire-retardant treated at fire-rated doors in addition to secondary replaceable solid hardwood stiles 3/4 inch thick at strike and hinge edges.

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- F. Bevel strike edge of single acting doors 1/8 inch in 2 inch.
 - G. Make cutouts and provide stops with mitered corners for glass vision panels.
 - 1. Stops at Non-Fire-Rated Doors: Prime finished steel.
 - 2. Stops at Fire-Rated Doors: Prime finished steel in accordance with label requirements.
 - H. Prefit and machine doors to receive hardware in factory for hardware requirements.
 - I. Prepare fire-rated doors for electric locksets, electric hinges; pre-drill doors for required control wiring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean and prepare substrate in accordance with manufacturer's directions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and specified quality standard.
- B. Install fire-rated assemblies in accordance with NFPA 80.
- C. Install doors plumb and square, and with maximum diagonal distortion of 1/16 inch. Install hardware according to the requirements of Section 08 71 00.
- D. Use machine tools to cut or drill for hardware.
- E. Coordinate installation of glass and glazing in doors.
- F. Seal door tops and bottoms according to requirements of Section 09 90 00.

3.04 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.

- B. Conform to specified quality standard for maximum diagonal distortion.

3.05 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit tight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

3.06 CLEANING AND PROTECTION

- A. Remove temporary coverings and protection.
- B. Clean installed products in accordance with manufacturer's instructions prior to Substantial Completion. Repair or replace damaged installed products.
- C. Protect installed product and finish surfaces from damage during construction.

END OF SECTION 08 14 23.23

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.
- B. Ligature Resistant Wall- and ceiling-mounted access units

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.; 1998 (R2011).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. Activar Construction Products Group: www.activarcpg.com/#sle.
 - 2. ACUDOR Products Inc: www.acudor.com/#sle.
 - 3. Babcock-Davis; ____: www.babcockdavis.com/#sle.
 - 4. MIFAB, Inc: www.mifab.com/#sle.
 - 5. Larsen's Manufacturing
 - 6. Milcor, Inc[<>]: www.milcorinc.com.

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7. Nystrom, Inc: www.nystrom.com/#sle.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Material: Steel.
 2. Style: Exposed frame with door surface flush with frame surface.
 3. Door Style: Single thickness with rolled or turned in edges.
 4. Frames: 16-gauge, 0.0598-inch minimum thickness.
 5. Steel Finish: Primed.
 6. Primed and Factory Finish: Polyester powder coat; color to match adjacent wall or ceiling surface.
 7. Door/Panel Size: As indicated on the drawings.
 8. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Latch/Lock: Tamperproof tool-operated cam latch.
- C. Ligature Resistant Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Material: Steel Steel.
 2. Style: Exposed frame with door surface flush with frame surface.
 3. Heavy-Duty Frames: 14-gauge, 0.0747-inch minimum thickness.
 4. Stainless Steel Finish: No.4 brushed finish.
 5. Primed and Factory Finish: Polyester powder coat; color to match adjacent wall or ceiling surface.
 6. Door/Panel Size: As indicated on the drawings.
 7. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

- c. Latch/Lock: Tamperproof tool-operated cam latch.
- d. Gasketing: Extruded neoprene, around perimeter of door panel.

2.02 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

3.04 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 00

SECTION 08 34 00
INTERIOR SLIDING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Factory fabricated interior sliding door frame, sidelite framing system, and track systems with operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Product and execution requirements for glass type and installation.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- H. TAS - Texas Accessibility Standards; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, information on glass and glazing, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, and installation requirements.
- D. Samples: Submit manufacturer's samples of the following sliding door components:
 - 1. Door veneer or laminate sample: 6 inches by 6 inches.

2. Aluminum frame finish sample.

- E. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- F. Manufacturer's qualification statement.
- G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Accessibility Compliance: Comply with TAS , ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for door installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty against excessive degradation of metal finishes, and include provision for replacement of units with excessive fading, chalking, or flaking.
- C. Include coverage for warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Sliding Doors:
 - 1. AD Systems, Inc.: www.specadsystems.com
 - a. Product: ExamSlide
 - b. Product: InsetSlide
 - 2. Serenity Sliding Door Systems: www.serenityslidingdoor.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 INTERIOR SLIDING ALUMINUM-FRAMED DOORS

- A. Frame Profiles: Extruded aluminum wrap frame with integral vertical jamb.
- B. Frame Finish: Class II color anodized.
 - 1. Color: As selected by Architect from manufacturer's standard colors.
- C. Door Type:
 - 1. Aluminum Stile & Rail Door: 1-3/4 inches thick glazed doors with extruded aluminum tubular stile and rail members. Welded and bolted corners.
 - a. Stile widths: 3-1/2 plus 1/2 inch stop.
 - b. Bottom Rail: 10 inches
 - c. Glazing: As specified, Section 08 80 00

2.03 MATERIALS

- A. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy 5005-H14, stretcher leveled.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063-T5 or alloy 6463-T5.
- C. Glass and Glazing Materials: See Section 08 80 00.

2.04 PERFORMANCE REQUIREMENTS

- A. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.

2.05 DOOR FABRICATION

- A. Factory assemble frame as one unit, including head and jambs; factory assemble operating and fixed door or sidelite panels.
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- D. Sizes: Allow for tolerances of rough framed openings, clearances, and shims around perimeter of assemblies.

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- E. Provide wall blocking within metal stud walls as required by manufacturer of sliding door assembly.
 - F. Joints and Connections: Flush, hairline width, and waterproof; accurately and rigidly joined corners.

2.06 FINISHES

- A. Class II Color Anodized Finish: AAMA 611 AA-M12C22A32 integrally colored anodic coating not less than 0.4 mils thick.

2.07 HARDWARE AND ACCESSORIES

- A. Pull Handles: .
 - 1. Finish: Stainless Steel, Satin finish.
 - 2. Color: As selected by Architect from manufacturer's standard range.
 - 3. Size: As selected.
- B. Sliding Door Header: Track and suspension system concealed with removable cover.
 - 1. Removable Track Cover: Extruded aluminum with integral end caps.
 - 2. Overhead Track: Extruded aluminum, with anti-rising, anti-derailing design.
 - 3. Door Suspension System: Two, wheeled carriers per panel, with nylon rollers; sized to match door weight.
- C. Door Locks: Section 08 71 00.
- D. Self-closing Spring Mechanism where indicated.
- E. Floor Guides: Concealed, integral jamb mounted.
- F. Blocking: Provide support wall blocking as required for sliding door locations in accordance with sliding door manufacturer's requirements.
- G. Anchors: Hot-dipped galvanized or stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors. Do not begin installation until unacceptable conditions are corrected.

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- C. See Sections 06 10 00 and 09 21 16 for installation of blocking, reinforcing plates, and concealed anchors in walls.
 - D. Wall Base of door side to be flush or minimal.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit as indicated.

3.03 INSTALLATION

- A. Install sliding door units in accordance with manufacturer's instructions.
- B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Use anchorage devices to securely fasten sliding door assembly to wall construction without distortion or imposed stresses.
- D. Install door units securely anchored in place, plumb, level, and true to location, in alignment with established lines and grades, without warp, bow, or racking of members.
- E. Install sliding doors to close against walls without gaps.
- F. Install operating hardware.
- G. Install perimeter trim and interior closures.
- H. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- I. Use machine tools to cut or drill for hardware.
- J. Coordinate installation of glazing.

3.04 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 foot straight edge.

3.05 ADJUSTING

- A. Adjust hardware for smooth operation.

3.06 CLEANING

- A. Remove protective material from factory finished surfaces.

- B. Remove labels and visible markings.
- C. Wash surfaces by method recommended and acceptable to sealant and sliding door manufacturer; rinse and wipe surfaces clean.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

3.08 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 08 34 00

SECTION 08 42 43
INTENSIVE CARE UNIT / CRITICAL CARE UNIT ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged units consisting of doors, sidelights, frames, and hardware; manual operation.

1.02 DEFINITIONS

- A. SX Panel: Sliding panel that swings open upon pushing.
- B. SO Panel: Sidelight panel, normally stationary, that will swing open upon pushing.
- C. X Panel: Sliding panel unable to swing.
- D. O Panel: Sidelight panel unable to swing.
- E. P Pocket Area: Sliding panel bypasses wall within pocket area.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- G. AWS A5.10/A5.10M - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods; 2023.
- H. ITS (DIR) - Directory of Listed Products; Current Edition.
- I. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.
- J. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog data, detail sheets, and specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Specimen warranty.
- C. Shop Drawings: Prepared specifically for this project; show dimensions of doors, sidelights, details of construction, and interface with other products.
- D. Samples: Two samples, each minimum size 6 inches square, showing actual product, color, and patterns for each finish product specified.
- E. Operating and Maintenance Data: Operating and maintenance instructions, and parts lists.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in factory packaging, protected from damage.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store products under cover and elevated above grade.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manually-Operated ICU/CCU Entrance Door Assemblies:
- B. Manually-Operated ICU/CCU Entrance Door Assemblies:
 - 1. ASSA ABLOY Entrance Solutions: www.besam-usa.com/#sle.
 - 2. Horton Automatics, a division of Overhead Door Corporation; Profiler ICU Sliding Door Series: www.hortondoors.com/#sle.
 - 3. Stanley Access Technologies: www.stanleyaccess.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Provide ICU/CCU entrances from a single manufacturer.

2.02 ENTRANCE DOOR ASSEMBLIES

- A. Entrance Assemblies: Factory assembled, manually-operated, extruded aluminum door and frame with normally-closed but operable sidelights, complete with hardware and operating components.
 - 1. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-suspended swinging panels or mechanically fastened corners with welded reinforcing brackets to reduce sag in sliding or breakout mode.
 - a. Door Thickness: 1-3/4 inch, nominal.
 - 2. Accessible Door Opening Force: Maximum of 5 pound-force to fully open door in compliance with ADA Standards and requirements of local authorities having jurisdiction.
 - 3. Panel Breakout Force: Maximum of 50 pound-force.
 - 4. Finish: Color anodized, AAMA 611 Class II; in compliance with NAAMM AMP 500-06.
 - a. Color: As selected by Architect.
- B. Dimensions:
 - 1. Overall Frame Width (Outside): As indicated on drawings.
 - 2. Clear Opening Width: As indicated on drawings, when swinging panels are fully open.
 - 3. Normal Operation Opening Width: As indicated on drawings.

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4. Overall Frame Height: As indicated on drawings.
 5. Clear Door Opening Height: As indicated on drawings.
 6. Framing Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
 - a. Nominal Sizes: 1-3/4 inch wide by 4-1/2 inch deep.
 7. Panel Thickness: 1-3/4 inch.
 8. Stile Design:
 - a. Medium stile, 3-1/2 inch, nominal width.
 9. Top Rail Height: 4 inch, nominal.
 10. Bottom Rail Height: 6-1/2 inch, nominal.
 11. Glazing Stop Width: Manufacturers standard.
 12. Glazing Thickness: 1/4 inch.

2.03 COMPONENTS

- A. Aluminum Extrusions for Doors, Sidelights, Headers, and Trim: Alloy as recommended by manufacturer for construction and specified finish; nominal 1/8 inch wall thickness.
- B. Sliding Door Header: Track and suspension system concealed with removable cover.
 1. Track: Extruded aluminum, with anti-rising, anti-derailing design.
 2. Door Suspension System: Two wheeled carriers per panel, with steel ball bearings; wheel diameter minimum 1-1/4 inch.
 3. Door Hanger Brackets: Nylon wheels with hardened steel bearings.
- C. Breakout Mechanism: 90 degree swing from any position in sliding cycle, released under not more than 50 pounds-force pressure at strike stile of panel, with sufficient strength to support weight of panels without drooping or racking.
 1. Provide entrance units having UL (DIR) or ITS (DIR) listed exitway.
- D. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
- E. Door Hardware: Provide door handles, recessed door pulls, and other hardware as required for normal and swing-open operation; factory install hardware to greatest extent possible.

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- F. Glazing: 1/4 inch thick fully tempered float glass, as scheduled.
 - G. Sealant for Within Door/Frame Assembly: As recommended or required by door manufacturer.

2.04 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
 - 2. Sheet and Plate: ASTM B209 (ASTM B209M).
 - 3. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are plumb, square, and ready for installation of entrances.
- B. Verify that overhead support is properly located and securely anchored.
- C. Verify that floor is properly prepared to receive recessed door guide track.
- D. Do not begin installation until substrates have been properly prepared.
- E. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 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. Where aluminum components will contact different metals, prior to installation paint contact surfaces with primer or apply sealant or tape recommended by manufacturer for protection against galvanic action.
- D. Where aluminum components will contact concrete or masonry, prior to installation paint contact surfaces with bituminous paint.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, except where more stringent requirements are specified.

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- B. Install entrances securely anchored in place, plumb, level, and true to location, in alignment with established lines and grades, without warp, bow, or racking of members.
 - C. Where frames are assembled in field, fit frame joints hairline tight without burrs or distortion; rigidly secure nonmoving joints and seal watertight.
 - D. Install field-installed hardware using concealed fasteners to greatest extent possible.

3.04 ADJUSTING

- A. Adjust entrances for correct function and smooth operation, without binding or scraping and without excessive noise; lubricate operating hardware and other moving parts.

3.05 CLEANING

- A. Remove temporary protection; clean exposed surfaces.

3.06 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 08 42 43

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping: Firestop at system junction with structure.
- B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
- C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

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- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
 - K. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2023.
 - L. TDI - Texas Revisions to the 2018 International Building Code; 2020.
 - M. TDI (PED) - Product Evaluation Directory - Texas Department of Insurance; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.

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- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum-Framed Storefronts:
 - 1. Arcadia, Inc: www.arcadiainc.com/#sle.
 - 2. Kawneer North America: www.kawneer.com/#sle.
 - 3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
 - 4. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
 - 5. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.02 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Position: Centered (front to back).
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
 - 3. Finish: Class I color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - 4. Finish Color: As selected by Architect from manufacturer's standard line.
 - 5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.

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6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by an independent agency for ASTM E1996 approval for Large and Small Missile impact and pressure cycling at design wind pressure.
3. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
4. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
5. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
6. Meet TDI requirements.
7. TDI (PED) approved.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Glazing Stops: Flush.
 - 3. Product: Trifab Versaglaze 451T by Kawneer.
- B. Glazing: See Section 08 80 00.
- C. Swing Doors: Glazed aluminum, narrow stile.
 - 1. Performance Requirements: Same as system in which it is installed.
 - 2. Member Wall Thickness: 0.125 inch
 - 3. Top Rail: 5 inches wide.
 - 4. Vertical Stiles: 3-1/2 inches wide.
 - 5. Bottom Rail: 10 inches wide.
 - 6. Glazing Stops: Square.
 - 7. Finish: Same as storefront.
 - 8. Product: Insulpour 350T Thermal Entrances by Kawneer.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. Glazing Accessories: See Section 08 80 00.

2.05 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
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2.06 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Other Door Hardware: See Section 08 71 00.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

3.05 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 43 13

SECTION 08 56 53
SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mental and Behavioral Health windows, with glazing

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- D. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- E. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- G. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied; 2006, with Editorial Revision (2015).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.
- B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

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- B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.
 - C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
 - 1. For existing openings show verified field dimensions.
 - D. Test Reports: Test reports for specific window model and glazing to be furnished, showing compliance with specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.
 - 1. Include testing agency qualifications.
 - 2. For structural, forced entry, and ballistic tests, provide details on method of anchorage to test frame.
 - E. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within five years after Date of Substantial Completion due to, but not limited to, the following:
 - 1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
 - 2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide named manufacturer product or pre-approved equal.
- B. Mental/Behavioral Health Window:
 - 1. Sherwood Windows Limited; www.sherwoodwindows.com

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2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASSEMBLIES

A. Mental and Behavioral Health Windows:

1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 01 60 00.
2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
3. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
4. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
5. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
6. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

B. Exterior Window Requirements: Comply with following performance requirements as well as other specified criteria.

1. Structural Performance: Capable of withstanding wind loads as specified by code without permanent deformation or breakage of components, when tested in accordance with ASTM E330/E330M.
2. Deflection of Framing Members Supporting Glass: Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edge to less than 1/175 of their lengths under specified design load.
3. Air Leakage of Operable Windows: 0.30 cfm/sq ft maximum leakage for operable window units when tested at 6.27 psf pressure difference in accordance with ASTM E283/E283M.
4. Air Leakage of Fixed Windows: 0.10 cfm/sq ft maximum leakage for fixed window units when tested at 6.27 psf pressure difference in accordance with ASTM E283/E283M.
5. Water Penetration: None, when tested in accordance with ASTM E331 at test pressure difference of 2.86 psf.

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6. Provide weep holes and internal water passages to conduct infiltrated water to exterior.
 7. Provide water shed members where sash frames lap in wrong direction to shed water.
 8. Provide factory-installed weatherstripping on operable sash.

2.03 MENTAL AND BEHAVIORAL HEALTH WINDOWS

- A. Mental and Behavioral Health Windows: Fixed, thermally broken aluminum framed windows with glazing stopes anchored into frame assembly.
 1. Basis of Design: 6200 Series manufactured by Sherwood Windows Limited
 2. Location: As indicated on drawings.
 3. Anti-ligature
 4. Operable blind secured behind glass
 5. Lockable
 6. Glazing: _____
 7. Integral Blinds: _____
 8. Framing and Sash: Extruded aluminum components; natural anodized finish.
 9. Glass-clad polycarbonate security Sash

2.04 ASSEMBLY COMPONENTS

- A. Aluminum Framing: ASTM B221 (ASTM B221M) extrusions of alloy and temper selected by manufacturer for strength, corrosion resistance, and finish required; not less than 1/8 inch thick at any location of frame and sash members.
- B. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
 1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.
- C. Weatherstripping: Factory installed; molded EPDM or neoprene.
- D. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.
- E. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.

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- F. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch minimum thickness per coat.

2.05 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawing details.
- B. Install windows in correct orientation (inside/outside or secure/non-secure).
- C. Anchor windows securely in manner so as to achieve performance specified.
- D. Separate metal members from concrete and masonry using bituminous paint.
- E. Set sill members and sill flashing in continuous bead of sealant.

3.03 ADJUSTING

- A. Adjust operating components for smooth operation while also providing tight fit at contact points and a secure enclosure; lubricate operating hardware.

3.04 CLEANING

- A. Clean exposed surfaces promptly after installation without damaging finishes.
- B. Remove and replace defective work.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation and maintenance to designated Owner personnel.

END OF SECTION 08 56 53

SECTION 08 71 13
POWER DOOR OPERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Operators for swinging doors.
- B. Controllers, actuators, and safety devices.

1.02 DEFINITIONS

- A. Activation Device: Device that sends an electrical signal to door operator to open door when actuated.
- B. Knowing Act: Consciously initiating the opening of a power-operated door using acceptable methods, including wall-mounted switches such as push plates and controlled access devices such as keypads, card readers, and key switches.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.10 - Power Operated Pedestrian Doors; 2017.
- C. BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors; 2019.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate power door operators with balance of door hardware and electrical work required for each affected door opening.
 - 1. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies, remote activation devices, and electric door latching hardware.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following parties.
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).

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3. Owner's Security Consultant.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
 2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
- C. Product Data: Provide data on system components, sizes, features, and finishes.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.
- E. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for components of power door operators. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Operators for Swinging Doors:
1. ASSA ABLOY Entrance Solutions: www.besam-usa.com/#sle.
 2. DORMA USA, Inc: www.dorma.com/#sle.
 3. LCN, an Allegion brand: www.allegion.com/us/#sle.
 4. Horton Automatics: www.hortondoors.com/#sle.
 5. Stanley Access Technologies: www.stanleyaccess.com/#sle.

2.02 POWER DOOR OPERATORS - GENERAL

- A. Electrically Operated or Controlled Hardware: Provide necessary power supplies, relays, and interfaces as required for proper operation; provide wiring between control components and to building power connection in compliance with NFPA 70.
- B. Comply with ADA Standards for egress requirements.
- C. Comply with NFPA 101 and requirements of authorities having jurisdiction; provide units selected for actual door weight and for light pedestrian traffic unless otherwise indicated.
- D. Exterior and Vestibule Doors: Provide equipment suitable for ambient operating temperature range of minus 20 to plus 140 degrees F.
- E. Exterior Doors: Provide units capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.

2.03 OPERATORS FOR SWINGING DOORS

- A. Door Operator: _____.
 - 1. Applications: Include operators for double doors.
 - 2. Speed Control: Variable, field-adjustable opening and closing cycles.
 - 3. Functionality: Low-energy power open, spring close operation.
 - a. Low-Energy Power Operators: Comply with BHMA A156.19; operator activated by pushing or pulling the door or by manual actuator, not a sensor; safeties not required.
 - 1) Force Required to Prevent Stopped Door From Opening or Closing: 15 lbf, maximum, measured at 1 inch from the latch edge of the door at any point in the swing cycle.
 - 2) Force Required to Release Latch When Unpowered: 15 lbf, maximum, measured at 1 inch from the latch edge of the door at any point in the swing cycle.
 - 3) Force Required to Set Door in Motion When Unpowered: 30 lbf, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.
 - 4) Force Required to Fully Open Door When Unpowered: 15 lbf, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.
 - 4. Mounting: Concealed overhead.

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5. Power Supply Units: Self-contained, electrically operated, and independent of door operator.
 6. Actuators: Manufacturer's standard.

2.04 CONTROLLERS, ACTUATORS, AND SAFETY DEVICES

- A. Controllers: Manufacturer's standard for products specified.
- B. Actuators: Manufacturer's standard for products specified and as indicated on drawings..
 1. Comply with BHMA A156.10 for actuator and safety types and zones.
- C. Safety Devices: Manufacturer's standard units recommended for project applications and conditions.
 1. Comply with BHMA A156.10 for actuator and safety types and zones.
 2. Swinging Door Safety Device: Door-mounted proximity detector device arranged to prevent operation of door when persons or obstructions are in the swing zone.

2.05 FINISHES

- A. Aluminum Finishes: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that electric power is available, in the correct location, and of the correct characteristics.

3.02 INSTALLATION

- A. Coordinate installation of components with related and adjacent work.
- B. Install equipment in accordance with manufacturer's instructions.

3.03 ADJUSTING

- A. Adjust door equipment for correct function and smooth operation.

3.04 CLEANING

- A. Remove temporary protection, clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate to Owner's representative equipment operation, operating components, adjustment features, and lubrication requirements.

END OF SECTION 08 71 13

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Plastic sheet glazing units.
- D. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- C. Section 08 11 16 - Aluminum Doors and Frames: Glazed lites in doors and borrowed lites.
- D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

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- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
 - K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
 - L. GANA (GM) - GANA Glazing Manual; 2022.
 - M. GANA (SM) - GANA Sealant Manual; 2008.
 - N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
 - O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
 - P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch² in size of glass units.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain glass and fabricated glass products through one source from a single manufacturer for each glass type.
- B. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

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- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.
- D. Ceramic Frit: Provide a five (5) year warranty to include coverage for deterioration of ceramic frit and replacement of same.
- E. Low-e Coating: Provide a ten (10) year warranty to include coverage for deterioration of low-e coating and replacement of same.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

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2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
 2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.03 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.
 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Spacer Color: Black.
 4. Edge Seal:
 - a. Color: Black.
 5. Purge interpane space with dry air, hermetically sealed.
- B. Type GL-1 - Insulating Glass Units: Vision glass, double glazed.
 1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Annealed float glass, low-iron, 1/4 inch thick, minimum.
 - a. Tint: Clear.

-
- b. Coating: Low-E (passive type), on #2 surface.
 - 4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - 5. Total Thickness: 1 inch.
 - 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.28, nominal.
 - 7. Visible Light Transmittance (VLT): 64 percent, nominal.
 - 8. Solar Heat Gain Coefficient (SHGC): 0.27, nominal.
 - 9. Visible Light Reflectance, Outside: 12 percent, nominal.
 - 10. Basis of Design Product: Solarban 70XL
- C. Type GL-1T - Insulating Glass Units: Vision glass, double glazed.
- 1. Applications: Where tempered glazing is required and other areas where indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Fully tempered float glass, low-iron, 1/4 inch thick, minimum.
 - a. Tint: Gray.
 - b. Coating: Low-E (passive type), on #2 surface.
 - 4. Metal edge spacer.
 - 5. Inboard Lite: Laminated float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
 - 7. Visible Light Transmittance (VLT): 50 percent, nominal.
 - 8. Solar Heat Gain Coefficient (SHGC): 0.30, nominal.
 - 9. Basis of Design Product: Solarban 60 (2) Optigray + Clear

2.04 GLAZING UNITS

- A. Type GL-2 - Monolithic Interior Vision Glazing with applied Security Film:
 - 1. Applications: As scheduled.
 - 2. Glass Type: Fully tempered float glass.

-
3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
 5. Security Film: Section 08 87 23 - Safety and Security Films

B. Type GL-3 - Monolithic Interior Vision Glazing:

1. Applications: As scheduled.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.05 PLASTIC SHEET GLAZING UNITS

A. Type GL-4 - Polycarbonate Flat Sheet: Ultraviolet (UV) stabilized.

1. Applications: Locations as indicated on drawings.
2. Type: Monolithic (single layer solid) sheet.
3. Silicone abrasion resistant coating for scratch resistance.
4. Tint: Clear, transparent.
5. Thickness: 1/2 inch.
6. Width: _____ inch.

2.06 LAMINATED GLASS INTERLAYERS

A. Polyvinyl Butyral (PVB) Interlayer for Laminated Glazing:

1. Functionality: Post-breakage safety and security.
2. Applications:
 - a. Interior laminated pane of insulating glass unit, Type GL-1.
3. Color: Clear.
4. Thickness: 0.060 inch, 60 mils, nominal.

2.07 GLAZING COMPOUNDS

- A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.08 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

2.09 FABRICATION

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Orient pattern and draw of glass pieces in same direction. Place waves in sheet glass parallel to floor.
- C. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- D. Grind smooth and polish exposed glass edges and corners.
- E. Tinted Glass: Cut clean to avoid edge stress. Nipping will not be permitted.
- F. Tempered and Heat Strengthened Glass: Fabricate each light before treatment. Cut to size, provide holes and cutouts required for accessories and other work that is attached to glass, finish edges.
 - 1. Treat heat strengthened and tempered glass by horizontal process in such a manner as to have roller distortion in a horizontal direction as installed in the building.
 - 2. Identify tempered glass with a permanent non-removable label.
- G. Glazing Gaskets:
 - 1. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

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2. Except for outside glazed systems, glazing gaskets are to have factory molded corners inside and out and shipped to the destination in full gasket "frames".

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - WET GLAZING METHOD (COMPOUND AND COMPOUND)

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- C. Locate and secure glazing pane using glazers' clips.
- D. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.06 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 80 00

SECTION 08 87 23
SAFETY AND SECURITY FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazing film applied to new glazing assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 08 80 00 - Glazing: New glazing to received film.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Record of product certification for safety requirements.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.
- D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.
- E. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.
- F. Specimen Warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.07 FIELD 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.

1.08 WARRANTY

- A. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. 3M Window Film: www.solutions.3m.com/#sle.
- B. Avery Dennison: www.averydennison.com/#sle.
- C. Flexvue Films: www.flexvuefilms.com/#sle.
- D. Impact Security, LLC: www.defenselite.com/#sle.
- E. Madico, Inc: www.madico.com/#sle.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SAFETY AND SECURITY GLAZING FILM

- A. Safety and Security Plastic Film: Polyester type. Transparent polyester film for permanent bonding to glass.
 - 1. Application: Locations as indicated on drawings.
 - 2. Surface Burning Characteristics: Flame Spread Index (FSI)/Smoke Developed Index (SDI) of Class A, 25/450, maximum, when tested in accordance with ASTM E84.

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3. Tensile Strength: Minimum of 31,500 psi when measured in accordance with ASTM D882.
 4. Impact Resistance: Comply with ANSI Z97.1 and 16 CFR 1201 impact test requirements when applied to 1/8 inch thick annealed glass.
 5. Color: Clear.
 6. Thickness Without Liner: 0.008 inch.
 7. Visible Light Transmittance (VLT): 88 percent, nominal.
 8. Manufacturers:
 - a. 3M Window Film; Ultra S800:
solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

- A. Accessory Materials: As recommended or required by film manufacturer.
- B. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.
- B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.
- C. Verify glass is not cracked, chipped, broken, or damaged.
- D. Verify that frames are securely anchored and free of defects.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
- B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
- C. Protect adjacent surfaces.

- D. Do not begin installation until substrates have been properly prepared.

3.03 INSTALLATION

- A. Do not apply glazing film when surface temperature is less than 40 degrees F or if precipitation is imminent.
- B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.
- C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.
- D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.
- E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.
- F. Remove labels and protective covers.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 08 87 23

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Thin-set ceramic tile and stone tile.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

- A. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

1.03 REFERENCE STANDARDS

- A. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 SUBMITTALS

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.

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2. Manufacturer's required bond/compatibility test procedure.
- C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
- D. Testing Agency's Report:
1. Description of areas tested; include floor plans and photographs if helpful.
 2. Summary of conditions encountered.
 3. Moisture and alkalinity (pH) test reports.
 4. Copies of specified test methods.
 5. Recommendations for remediation of unsatisfactory surfaces.
 6. Product data for recommended remedial coating.
 7. Submit report not more than two business days after conclusion of testing.
- E. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

- A. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Section 03 54 00 - Cast Underlayment.
- B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 - 2. Use product recommended by testing agency.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
 - b. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE VAPOR BAN E with LATICRETE NXT LEVEL PLUS: www.laticrete.com/#sle.
 - d. Maxxon Corporation; Maxxon MVP Two-Part Epoxy: www.maxxon.com/#sle.
 - e. USG Corporation; Durock CoverPrep: www.usg.com/#sle.
 - f. UZIN UTZ NORTH AMERICA, INC; UZIN PE 460 with UZIN PE 280 and UZIN NC 170 LevelStar: <https://us.uzin.com/#sle>.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:

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1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
 3. Preliminary cleaning.
 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 5. Specified remediation, if required.
 6. Patching, smoothing, and leveling, as required.
 7. Other preparation specified.
 8. Adhesive bond and compatibility test.
 9. Protection.
- B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
 3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

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- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

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- F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.

3.10 APPLICATION OF REMEDIAL FLOOR TREATMENT

- A. Comply with requirements and recommendations of treatment manufacturer.

3.11 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.
- B. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.

END OF SECTION 09 05 61

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Gypsum sheathing.
- E. Joint treatment and accessories.
- F. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- H. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

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- I. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
 - J. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
 - K. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
 - L. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.
 - M. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
 - N. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
 - O. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
 - P. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
 - Q. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018 (Reapproved 2023).
 - R. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
 - S. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2023.
 - T. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).
 - U. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
 - V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
 - W. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
 - X. ASTM E413 - Classification for Rating Sound Insulation; 2022.
 - Y. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
 - 1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
 - 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
 - 2. FireTrak Corporation.
 - 3. Steel Construction Systems: www.steelconsystems.com/#sle.
- C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum

deflection of wall framing of L/120 at 5 psf; minimum 22 gage.

1. In seclusion rooms, provide minimum 16 gauge studs.
 2. Studs: C-shaped with knurled or embossed faces.
 3. Runners: U shaped, sized to match studs.
 4. Ceiling Channels: C-shaped.
 5. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
- D. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
- E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
- G. Wallboard Grid Suspension System: ASTM C645, heavy duty galvanized steel grid, direct-hung 1-1/2 inch deep interlocking cross tees and main runners; 1-1/2 inch wide face, 2 foot by 4 foot module. ASTM C635/C635M heavy duty classification.
1. Manufacturers:
 - a. Armstrong World Industries, Inc.: www.armstrong.com.
 - b. Chicago Metallic Corporation: www.chicago-metallic.com.
 - c. USG Corporation: www.usg.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BOARD MATERIALS

- A. Gypsum Wallboard, Type X: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - a. Ceilings: 5/8 inch.

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2. Paper-Faced Products:
 - a. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; USG Sheetrock Brand Firecode X Gypsum Panels: www.usg.com.
 - B. Impact Resistant Wallboard:
 1. Application: High-traffic areas indicated.
 2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 8. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
 9. Type: Fire-resistance-rated Type X, UL or WH listed.
 10. Thickness: 5/8 inch.
 11. Edges: Tapered.
 12. Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant.
 - b. National Gypsum Company; Gold Bond HI-Impact XP Gypsum Board.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 - C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 2. Type X Thickness: 5/8 inch.
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3. Edges: Tapered.
 4. Products:
 - a. CertainTeed Corporation; Diamondback Glassroc Tile Backer.
 - b. Georgia-Pacific Gypsum; DensArmor Plus: www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
 - d. US Gypsum Corporation; USG Durock Glass-Mat Tile Backerboard.
 - D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch.
 3. Edges: Tapered.
 - E. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
 1. Application: Exterior sheathing, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 4. Type X Thickness: 5/8 inch.
 5. Edges: Square.
 6. Glass Mat Faced Products:
 - a. CertainTeed Corporation; GlasRoc 1/2" Exterior Sheathing: www.certainteed.com/#sle.
 - b. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com/#sle.
 - c. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
 - d. USG Corporation; Securock Brand UltraLight Glass-Mat Sheathing 1/2 in. (12.7 mm): www.usg.com/#sle.
 - e. USG Corporation; Securock Brand UltraLight Glass-Mat Sheathing Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

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- F. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Shaft Liner: www.americangypsum.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant): www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Shaftliner: www.goldbondbuilding.com/#sle.

2.04 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2 inch.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 3. Products:
 - a. CertaPro AcoustaTherm Batts manufactured by CertainTeed Corporation: www.certainteed.com.
 - b. Sound Control Batts manufactured by Johns Manville Corporation: www.jm.com.
 - c. Sound Attenuation Batt manufactured by Owens Corning Corp: www.owenscorning.com.
 - d. QuietTherm manufactured by Knauf Insulation: www.knaufusa.com.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: See Section 07 25 00.
- D. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or rolled zinc, unless noted otherwise.
1. Types: As detailed or required for finished appearance.

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2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 2. Ready-mixed vinyl-based joint compound.
- F. High Build Drywall Surfacers: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Textured Finish Materials: Latex-based compound; plain.
- H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- J. Tamper Resistant Fasteners: Section 05 05 53 - Security Metal Fasteners

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
 2. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.

3.03 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.

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- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - C. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
 - D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
 - E. Blocking: Install treated wood blocking or sheet metal anchor plates in stud cavities for support of:
 - 1. Architectural Wood Casework
 - 2. Framed openings.
 - 3. Wall-mounted cabinets.
 - 4. Plumbing fixtures.
 - 5. Toilet partitions.
 - 6. Toilet accessories.
 - 7. Wall-mounted door hardware.
 - 8. Equipment
 - 9. Lighting Fixtures

3.04 CEILING FRAMING

- A. Contractor's Option: Ceiling Framing System.
 - 1. Option No. 1: ASTM C754 using steel furring channels and hat channels.
 - 2. Option No. 2: Wallboard Grid Suspension System
 - a. Install systems according to ASTM C636/C636M to support superimposed loads with maximum permissible deflection of 1/360 and maximum surface deviation of 1/8 inch

in 10 feet.

- B. Level ceiling system to a tolerance of 1/360.
- C. Install framing after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- D. Install framing independent of walls, columns, and above-ceiling work.
- E. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated.
- F. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- G. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- H. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- I. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- J. Laterally brace suspension system.
- K. Install bracing as required at exterior soffit locations to resist wind uplift.

3.05 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board and the following joint conditions:
 - a. Partition ends abutting other materials.
 - b. Partition tops abutting structure.
 - c. Partition bottom abutting floor.
 - d. Opening frame perimeter joint to abutting materials.
 - 3. Framed Openings: Seal gypsum board terminations in door and window frames.

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4. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

- C. Acoustic Seal Tape: Use to close voids where finished end of gypsum board partition abuts a dissimilar material such as a metal mullion or frame. Apply continuous to the abutting surface and install the gypsum board tight against it to provide compression along its entire length. Tape to form an acoustic, vision and light barrier.

3.06 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically vertically, with edges butted tight and ends occurring over firm bearing.
 1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
- D. Coated Glass Mat Backer Board:
 1. Install at toilet rooms, janitor's closets, and ceramic tile substrate.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.07 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 2. Provide full-height vertical joint each door opening, locate at outside edge, hinge side of door frame.
 - a. Ceiling-height door frames shall constitute control joints.
 3. Maintain fire rated construction integrity at fire rated partitions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.08 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
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- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
 - C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 - D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
 - F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.09 TEXTURE FINISH

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.10 ALTERATIONS TO EXISTING GYPSUM BOARD

- A. Butt Joints: Where new gypsum board partitions are required to align flush with existing construction in the same plane, cut existing board away in straight line centered over framing member.
 - 1. Use rasp or sanding block to slope edges inward at 45 degree angle. Sand existing texture to render smooth surface avoiding damage to face paper. Remove all loose surfacing material.
 - 2. Install abutting new board and finish as a butt joint with joint tape and compound as required for new work. Finish so there is no evidence of a joint.
- B. Intersection Joints: Sand existing texture to render smooth surface avoiding damage to face paper. Install intersecting framing and board. Finish with folded joint tape and compound as

required for new work.

- C. Finishing: Match finish of existing adjacent gypsum board surfaces so that jointing of new to existing will not be visible in finished surface.

3.11 PARTITION MARKINGS

- A. Mark fire-rated partitions and smoke barriers with 3-inch-high upper case letters with 3/8 inch stroke stenciled in red paint.
- B. Place markings 6-inches above ceilings both sides of partitions as follows:
1. Centered over doors.
 2. Maximum 30 feet on center interval and not less than 15 feet from end of partition.
 3. Lettering Copy (as applicable):
 - a. "1-HOUR FIRE RATED-PROTECT ALL OPENINGS"
 - b. "2-HOUR FIRE RATED-PROTECT ALL OPENINGS"
 - c. "4-HOUR FIRE RATED-PROTECT ALL OPENINGS"
 - d. "SMOKE BARRIER, _#_-HOUR FIRE RATED-PROTECT ALL OPENINGS" (with appropriate fire rating)
- C. Mark point of partition type demarcation with 1 inch wide painted vertical line from ceiling line to bottom of structure at the following conditions:
1. from rated partition type to non-rated partition type;
 2. from change in partition type rating.

3.12 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 09 21 16

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement plastering.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Structural metal framing for plaster.
- B. Section 06 10 00 - Rough Carpentry: Wood stud framing for plaster.
- C. Section 07 25 00 - Weather Barriers: Water-resistive barrier.

1.03 REFERENCE STANDARDS

- A. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- B. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014 (Reapproved 2022).
- C. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2023.
- D. ASTM C847 - Standard Specification for Metal Lath; 2018.
- E. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015 (Reapproved 2020).
- F. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2023a.
- G. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2023.
- H. PCA EB049 - Portland Cement Plaster/Stucco Manual; 2003.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Samples:
 - 1. Submit two samples, 18 by 18 inch in size illustrating finish color and texture.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Plaster application to match existing wall finish.
- B. Provide either factory prepared plaster system or job-site mixed plaster to match existing wall finish in thickness, texture, and finish.
- C. Comply with requirements of PCA EB049

2.02 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
 - 1. Plaster Type: Factory prepared plaster mix or Jobsite mixed plaster.
 - 2. Finish: Acrylic.
- B. Solid Plaster Base: Concrete masonry.
 - 1. Plaster Type: Factory prepared plaster mix or Jobsite mixed plaster.
 - 2. Finish: Acrylic.

2.03 FACTORY PREPARED CEMENT PLASTER

- A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and elastomeric finish coat; install in accordance with ASTM C926.
 - 1. Provide continuous exterior insulation as part of the system, by the same manufacturer.
 - 2. Provide weather resistive barrier as part of the system, by the same manufacturer.
 - 3. Manufacturers:
 - a. Master Wall, Inc: www.masterwall.com/#sle.
 - b. Parex USA, Inc: www.parexusa.com/#sle.
 - c. Sto Corp: www.stocorp.com/#sle.

2.04 JOBSITE MIXED CEMENT PLASTER

- A. Materials:
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1. Portland Cement: ASTM C150/C150M, Type I.
 2. Lime: ASTM C206 Type S.
 3. Sand: Clean, well graded, and complying with ASTM C897.
 4. Water: Clean, fresh, potable, and free of mineral or organic matter that could adversely affect plaster.

B. Plaster Mixes: Proportioned in accordance with ASTM C926; parts by volume.

2.05 ACCESSORIES

A. Lath:

1. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
 - a. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
 - b. Weight: 3.4 lb/sq yd.

B. Corner Mesh: ASTM C1063; Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.

C. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.

D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.

1. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths

E. Water-Resistive Barrier: See Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

3.02 EXISTING PLASTER REMOVAL

- A. In areas indicated, remove existing plaster to expose underlying substrate.
- B. Select, employ, and control methods of removal.

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1. Protect substrate and adjacent materials to remain from damage.
 2. Provide scoured or fractured aggregate face on plaster to remain.
 3. Leave square-edged profile, 75 degrees to 105 degrees measured between plane of wall and edge thickness, between areas of partial depth and full depth removal.
- C. Do not use power-operated grinders.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.
- B. Integrate water-resistive barrier with flashing accessories, and adjacent doors, windows, penetrations, and cladding transitions.
- C. For two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.04 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.05 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
 1. Apply base coat(s) to fully embed lath and to specified thickness.
 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling Coat:
 1. Apply leveling coat to specified thickness.
- D. Finish Coats:
 1. Cement Plaster:
 - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.

- b. Apply desired surface texture while mix is still workable.
- 2. Primer and Acrylic or Elastomeric Coatings:
 - a. Remove surface contaminants such as dust and dirt without damaging substrate.
 - b. Apply primer in accordance with manufacturer's instructions.
 - c. Apply finish coating in number of coats and to thickness recommended by manufacturer.

3.06 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.07 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION 09 24 00

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 03 54 00 - Cast Underlayment.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).
- B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
- C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2021).
- D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).

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- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
 - J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
 - K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
 - L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
 - M. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
 - N. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
 - O. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
 - P. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.
 - Q. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
 - R. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2014 (Reaffirmed 2019).
 - S. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).
 - T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
 - U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
 - V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, and setting details.
- D. Samples:
 - 1. Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: All products of each type by the same manufacturer.

-
1. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Glazed Wall Tile: ANSI A137.1 standard grade.
1. Size: As scheduled.
 2. Edges: Cushioned.
 3. Surface Finish: As scheduled.
 4. Manufacturer, Pattern, and Color(s): As scheduled.
 5. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes indicated.
- C. Porcelain Tile: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: As indicated on drawings.
 3. Surface Finish: As scheduled.
 4. Manufacturer, Pattern, and Color(s): As scheduled.
 5. Trim Units: Matching bullnose, cove base, and cove shapes in sizes indicated.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Finish as scheduled, style and dimensions as indicated on drawings, for setting using tile mortar or adhesive.
1. Applications: In areas indicated
 2. Products:
 - a. Manhattan American Terrazzo Strip Company: www.manhattanamerican.com
 - b. Schluter-Systems; ____: www.schluter.com/#sle.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 2. Custom Building Products: www.custombuildingproducts.com/#sle.
 3. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.

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4. LATICRETE International, Inc: www.laticrete.com/#sle.
 5. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 - a. Large Tile: Thinset, medium bed, non-sag mortat for installation of ceramic tile and stone no larger than 48 x 48 inches with a minimum of 330 psi bond strength to porcelain tile.
 - 1) H.B. Fuller Construction Products, Inc;TEC Ultimate Large Tile Mortar: www.tecspecialty.com.
 - 2) Mapei CorporationUltraflex LFT: www.mapei.com/#sle.
 - 3) Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar: www.custombuildingproducts.com/#sle.
 - b. Glass mosaic tile: Glass tile thinset with white latex modified mortar only.
 2. Products:
 - a. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - b. Custom Building Products: www.custombuildingproducts.com/#sle.
 - c. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
 - d. Mapei Corporation: www.mapei.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 2. Custom Building Products: www.custombuildingproducts.com/#sle.
 3. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
 4. LATICRETE International, Inc: www.laticrete.com/#sle.

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5. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
- C. Standard Grout: ANSI A118.6 standard cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
- D. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Use this type of grout at floor tile and shower receptors.
 2. Color(s): As selected by Architect from manufacturer's full line.

2.05 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
 2. Fluid or Trowel Applied Type:
 - a. Thickness: 20 mils, maximum.
 - b. Products:
 - 1) H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
 - 2) LATICRETE International, Inc: www.laticrete.com/#sle.
 - 3) Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
- B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 2. Bonded Sheet Membrane Type:
 - a. Material: Polyethylene sheet membrane with non-woven fabric laminated to both sides, 20 to 30 mils thick, nominal.
- C. Epoxy Haze Remover:
1. Products:

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- a. Mapei; Ultracare Epoxy Grout Haze Remover: www.mapei.com
 - b. Miracle Sealants Company; Epoxy Grout Film Remover: www.miraclesealants.com.
 - c. Custom Building Products; Non-Cement Grout Haze Remover by Aqua Mix:
www.custombuildingproducts.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install crack isolation sheet at substrate cracks and control joints in accordance with manufacturer's instructions.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

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- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
 - C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
 - D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
 - E. Form internal angles square and external angles bullnosed.
 - F. Install non-ceramic trim in accordance with manufacturer's instructions.
 - G. Metal Edge Trim:
 - 1. Install at exposed tile edges and edges abutting dissimilar materials.
 - 2. Install continuous metal edge trim at juncture of ceramic tile as noted on the Drawings.
 - H. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
 - I. Sound tile after setting. Replace hollow sounding units.
 - J. Keep control and expansion joints free of mortar, grout, and adhesive.
 - K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
 - L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
 - M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Use crack isolation sheet under all tile unless other underlayment is indicated.
 - 2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
 - 3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F115.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.06 CLEANING

- A. Remove epoxy grout haze from tile surfaces using Epoxy Haze Remover according to manufacturer's directions.
- B. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Cover tile floors with heavy Kraft paper, tape in place.
- B. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 30 00

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

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2. Extra Acoustical Units: Quantity equal to 5 percent of total installed. Round up quantities to the nearest box. Clearly and legibly label boxes to indicate type.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
 3. USG Corporation: www.usg.com/ceilings/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

- A. As indicated on drawings.
- B. Acoustical Panels: Mineral fiber with membrane-faced overlay, with the following characteristics:
 1. Classification: ASTM E1264 Type IV.
 - a. Form: 2, water felted.
 - b. Pattern: "E" - lightly textured.
 2. Size: 24 by 24 inches.
 3. Thickness: 3/4 inch.
 4. NRC Range: Minimum 0.80, determined in accordance with ASTM E1264.
 5. Panel Edge: Beveled Tegular.

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6. Fire Hazard Classification: Class A.
 7. Suspension System: Exposed grid.
 - a. Provide hold down clips in locations indicated.
 8. Products:
 - a. Armstrong World Industries, Inc; Calla Health Zone:
www.armstrongceilings.com/#sle.

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- C. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 9/16 inch face width.
 3. Finish: Baked enamel.
 4. Color: White.
 5. Products:
 - a. Armstrong World Industries; Suprafine XL: www.armstrongceilings.com
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.

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- D. Perimeter Moldings: Same metal and finish as grid.
 - E. Acoustical Insulation: Specified in Section 07 21 00.
 - F. Acoustical Sealant for Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
 - G. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Miter corners.
 - 3. Apply flexible wall angle at round columns, free-form vertical surfaces and other irregular intersections.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Install units after above-ceiling work is complete.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Seal cut edges in accordance with manufacturer's instructions.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

END OF SECTION 09 51 00

SECTION 09 54 23
LINEAR METAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Linear metal ceilings.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.
- B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. Product Data: Furnish for component profiles.
- B. Shop Drawings: Indicate reflected ceiling plan.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.

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- C. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Linear Metal Ceilings:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - 2. Certaineed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - 3. Gordon Incorporated: www.gordon-inc.com
 - 4. Rockfon: www.rockfon.com/#sle.
 - 5. USG Corporation: www.usg.com/ceilings/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LINEAR METAL CEILINGS

- A. Basis of Design: Winlock Accessible Security Ceiling Systems
- B. Linear Metal Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.
- C. Performance Requirements:
 - 1. Design to support imposed loads of indicated items without eccentric loading of supports.
 - 2. Design for maximum deflection of 1/360 of span.
 - 3. Systems Located Outside Building Envelope:
 - a. Accommodate wind and suction loads and wind uplift without damage in accordance with applicable code.

2.03 COMPONENTS

- A. Linear Metal Panels:
 - 1. Type: Linear panel with filler strips; snap-in installation.

-
- a. Size and Configuration: As indicated on drawings.
 - b. Filler Strip: Manufacturer's standard recessed strip to fill space between panels.
 - 2. Material: Aluminum sheet, ASTM B209/B209M.
 - a. Finish: Custom, to match Architect's sample.
 - B. Edge Molding, Expansion Joints, and Splices: Same material, thickness, and finish as linear panels.
 - C. End Caps: Formed metal; same color and finish as sight-exposed surfaces of linear panels.
 - D. Accessories: Stabilizer bars and hold down clips as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.
 - E. Suspension Members: Formed aluminum sections, with integral attachment points; galvanized finish; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
 - F. Suspension Wire: Steel, annealed, galvanized finish, 9 gauge, 0.1144 inch diameter.
 - G. Insulation: See Section 07 21 00.

2.04 FABRICATION

- A. Shop cut linear panels to accommodate mechanical and electrical items.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Verify that field measurements are as indicated.

3.02 INSTALLATION

- A. Suspension Components:
 - 1. Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
 - 2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.

3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.

B. Linear Metal Ceiling:

1. Install linear panels and other system components in accordance with manufacturer's instructions.

3.03 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.
- C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.04 CLEANING

- A. Clean surfaces.
- B. Replace damaged or abraded components.

END OF SECTION 09 54 23

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 54 00 - Cast Underlayment: Sub-floor filler and leveling and sound control mat.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).
- B. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2021).
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.
- E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Samples:
 - 1. Base: Two, 12 inch long, each type, color, and pattern.
 - 2. Resilient flooring: Two, 12 x 12 inch, each type, color, and pattern.

3. Welding rod: Two, each color.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring: Transparent or translucent vinyl wear layer over interlayer and backing.

1. Minimum Requirements: Comply with ASTM F1303, Type I, with Class C foamed plastic backing.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.

3. Wear Layer Thickness: 0.028 inch minimum.

4. Total Thickness: 0.15 inch minimum.

5. Sheet Width: 72 inch (1829 mm) minimum.

6. Seams: Heat welded.

7. Manufacturer, Pattern, and Color: As indicated on drawings.

B. Vinyl Sheet Flooring: Transparent or translucent vinyl wear layer over interlayer and backing.

-
1. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.
 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 3. Wear Layer Thickness: 0.028 inch minimum.
 4. Total Thickness: 0.11 inch minimum.
 5. Sheet Width: 72 inch (1829 mm) minimum.
 6. Seams: Heat welded.
 7. Manufacturer, Pattern, and Color: As indicated on drawings.
- C. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; Style A, Straight and Style B, Coved, as scheduled.
1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 2. Height: As indicated on drawings.
 3. Height: As scheduled.
 4. Thickness: 0.125 inch.
 5. Finish: Satin.
 6. Length: Roll.
 7. Manufacturers, Patterns, and Color: As indicated on drawings.

2.03 ACCESSORIES

- A. Subfloor filler: Section 03 54 00 - Cast Underlayment.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: As indicated on drawings.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Conduct tests by an independent testing agency acceptable to Owner.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 - 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.

3.02 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- D. Prohibit traffic until filler is fully cured.
- E. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.

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- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
 - E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.
- C. Cut sheet at seams in accordance with manufacturer's instructions.
- D. Seal seams by heat welding where indicated.
- E. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with scheduled cap strip.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Wrap outside base corners; provide minimum 12-inch returns each side of corner. Cut back of base using standard cove base groover. Use heat-gun at base corner to ensure tight toe-to-floor joint.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 65 00

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Wall substrate.
- B. Section 09 91 23 - Interior Painting: Preparation and priming of substrate surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- B. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, 12 by 12 inch in size illustrating color, finish, and texture.
- E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- F. Manufacturer's Installation Instructions: Indicate special procedures.
- G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.

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- B. Protect packaged adhesive from temperature cycling and cold temperatures.
 - C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
- B. Wall Covering: Fabric-backed vinyl roll stock.
 - 1. Comply with ASTM F793/F793M, Category V, Type II.
 - 2. Flame Resistance: ASTM E84, Class A.
 - 3. Roll Width: 54 inches.
 - 4. Micro-perforate wallcovering located on interior surfaces of outside walls.
 - 5. Manufacturer, Pattern, and Color: As indicated on drawings.
- C. Wall Covering: Fabric-backed vinyl roll stock.
 - 1. Comply with ASTM F793/F793M, Category V, Type II.
 - 2. Flame Resistance: ASTM E84, Class A.
 - 3. Roll Width: 27 inches.
 - 4. Micro-perforate wallcovering located on interior surfaces of outside walls.
 - 5. Manufacturer, Pattern, and Color: As indicated on drawings.
- D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.
- D. Schedule installation of wall covering as late as possible to prevent damage during construction and movement of materials.

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- C. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
- D. Marks: Seal with shellac those that may bleed through surface finishes.
- E. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- F. Vacuum clean surfaces free of loose particles.
- G. Remove and store wall plates and accessories.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Use wall covering in roll number sequence.
- D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- F. Butt edges tightly.

- G. Horizontal seams are not acceptable.
- H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- J. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- K. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.
- L. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION 09 72 00

SECTION 09 72 16.16
RIGID SHEET VINYL WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Resilient sheet wallcovering.
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 72 00 - Wall Coverings.
- B. Section 10 26 00 - Wall and Door Protection: PVC wall protection.

1.03 REFERENCE STANDARDS

- A. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact); 2016.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- D. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; 2002.
- E. DIN EN ISO 527-1 - Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1:2012); 2012.
- F. ISO 868 - Plastics and Ebonite - Determination of Indentation Hardness by Means of a Durometer (Shore Hardness); 2003.
- G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Samples
 - 1. Resilient sheet, two, 12-inch by 12-inch, each color/pattern.

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- D. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
 - E. Manufacturer's Instructions: Indicate special procedures.
 - F. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in the performing the work of this section, with not less than three years of documented experience and approved by manufacturer.
- C. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the SCAQMD 1168 and BAAQMD 8-51.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products undamaged in manufacturer's clearly labeled unopened wrappings.
- B. Coordinate delivery with scheduled installation date to allow minimum storage time at site.
- C. Store products in clean, dry location where temperatures are maintained at minimum 15 degree Fahrenheit with normal humidity. Do not store in upright position.
- D. Stored panels flat and pre-condition a minimum of 24 hours in ambient temperatures similar to the prevailing operational conditions.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements
 - 1. Maintain surfaces and materials at minimum temperature of 55 degree Fahrenheit three days before, and during application period.
 - 2. Ensure maximum surface moisture conforms to wall covering manufacturer's requirements. Ensure surface exhibits negative alkalinity.
 - 3. Furnish minimum 15 candlepower lighting on surfaces to receive wall covering.
 - 4. Furnish adequate and continuous ventilation during Work and after wall covering installation.
- B. Verify existing conditions and substrates before starting Work. Correct unsatisfactory conditions before proceeding.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warrant the Work of this Section for one year to be free of defects in materials or workmanship as indicated by the following:
 - 1. Noticeable discoloration, streaking, blooming, darkening, or fading.
 - 2. Peeling, cracking, blistering, or releasing from substrate.
 - 3. Noticeable deterioration of finish.
- C. Provide ten year manufacturers warranty for defects in materials and workmanship under normal use and service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Altro: www.altrofloors.com.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RESILIENT SHEET WALLCOVERING

- A. Extruded Semi-Rigid Vinyl Sheet
 - 1. Product: Altro Whiterock.
 - 2. Material: Thermoplastic color-through semi-rigid vinyl (PVC) sheet.
 - 3. Physical Properties:
 - a. Impact resistance: (ASTM D5420): 160 in-lbs.
 - b. Tensile strength (DIN EN ISO 527-1): 7,000 psi.
 - c. Shore hardness D (ISO 868): 79.
 - d. Moisture vapor transmission rate (ASTM E96/E96M): 0.17 grains/h/sf.
 - e. Fire hazard classification (ASTM E84): Class A.
 - 4. Thickness: 0.10 inch.
 - 5. Panel sizes: 4 foot wide by 8 or 10 feet long.
 - 6. Mounting: Adhesive.
 - 7. Joint Treatment: Heat welded.

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8. Color: As scheduled, Section 09 06 00

2.03 ACCESSORIES

- A. Pre-manufactured Trim: Manufacturers standard rigid extruded vinyl.
- B. Adhesive: Type recommended by manufacturer to suit application, including primer/sealer.
- C. Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl wallcovering for heat welding seams, in color matching field color.
- D. Filler for Coved Base: Plastic.
- E. Sealant: Type recommended by manufacturer to suit application, including primer/sealer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Ensure surfaces to receive wallcovering are clean, true, and free of irregularities.
- B. Ensure wall surface flatness tolerance do not vary more than 1/8-inch in 10 foot nor vary at a rate greater than 1/16-inch per running foot.
- C. Schedule installation of wallcovering as late as possible to prevent damage during construction and movement of materials.

3.02 APPLICATION

- A. Handle and apply wallcovering according to manufacturer's printed instructions.
- B. Install wallcovering true, plumb and level, securely and rigidly adhered.
- C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.
- D. Thermoform inside and outside corners to pencil round radius; provide jointless installation.
- E. Install wall covering before installation of plumbing and electrical trim, bases, cabinets, and hardware and items attached to or spaced slightly from wall surface.
- F. Finish seams in sheet vinyl by heat welding.
- G. Height: Extend from top of wall base to finish ceiling.

3.03 CLEANING

- A. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

- B. Clean wallcovering of adhesives, dust, dirt and other contaminants.
- C. Remove debris. Leave areas neat and clean.

END OF SECTION 09 72 16.16

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Shop-primed items.
- B. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

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- E. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 3. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, submit each color in each sheen available.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

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- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer.
1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
1. Kelly-Moore Paints: www.kellymoore.com/#sle.
 2. PPG Paints: www.ppgpaints.com/#sle.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
1. Two top coats and one coat primer.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

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- B. Patching Material: Latex filler.
 - C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Fiber Cement Siding: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

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2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 3. Clean concrete according to ASTM D4258. Allow to dry.
- G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
- H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- I. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- J. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- K. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

- A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

END OF SECTION 09 91 13

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Prime surfaces to receive wall coverings.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 10. Glass.
 - 11. Concrete masonry units in utility, mechanical, and electrical spaces.

12. Acoustical materials, unless specifically indicated.

13. CoASTM D6ncealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

B. Section 09 91 13 - Exterior Painting.

C. Section 09 96 00 - High-Performance Coatings.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2023.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.

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4. Manufacturer's installation instructions.
 - C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, submit each color in each sheen available.
 - D. Manufacturer's Instructions: Indicate special surface preparation procedures.
 - E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
 - F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

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- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
 - C. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Colors: To be selected from manufacturer's full range of available colors.

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1. Selection to be made by Architect after award of contract.
 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
 1. Two top coats and one coat primer.
 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
 1. Medium duty applications include doors, door frames, and railings.
 2. Two top coats and one coat primer.
- C. Medium Duty Vertical and Overhead: Including gypsum board, plaster, concrete, concrete masonry units, uncoated steel, shop primed steel, galvanized steel, and aluminum.
 1. Two top coats and one coat primer.
 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

-
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
 2. Plaster and Stucco: 12 percent.
 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
- F. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.
- I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

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- J. Galvanized Surfaces:
 - K. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.
 - L. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
 - M. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
-

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 23

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

- A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- C. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
 - 3. Manufacturer's installation instructions.
- C. Samples: Submit two painted samples, illustrating selected colors and textures with specified coats cascaded. Submit on identical materials to which they will be applied on job, 12 x 12 inch in size. On each sample identify Finish Schedule Key, finish, formula, color name and number, and sheen type.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document that applies to application on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for general requirements for mock-ups.
- B. Finish one complete surface of each color scheme required, indicating selected color, materials and workmanship.
- C. Before proceeding with texture coating application, finish one complete surface of each color/texture scheme required, indicating selected color, texture, materials and workmanship.
- D. Locate where directed.
- E. Mock-up may remain as part of the work.

1.07 FIELD CONDITIONS

- A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- D. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for bond to substrate and degradation of chemical resistance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. High-Performance Coatings: Epoxy.
 - 1. Base Manufacturer: Sherwin Williams Company: www.sherwin-williams.com.
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2. Glidden Professional: www.gliddenprofessional.com.
 3. Benjamin Moore & Co: www.benjaminmoore.com.
 4. Substitutions: Section 01 60 00 - Product Requirements.

2.02 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
 1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
 2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
 3. Colors: Selected from manufacturer's standard colors.
- B. Epoxy Coating: Two coats, water-based epoxy, eggshell finish.
 1. Product characteristics:
 - a. Percentage of solids by volume: 36-45, minimum.
 - b. Dry film thickness, per coat: 2, minimum.
 2. Product:
 - a. Pro Industrial Pre-Catalyzed Waterbased Epoxy (K45) manufactured by Sherwin Williams.
 - b. Pre-Catalyzed Waterborne Epoxy (V341) manufactured by Benjamin Moore.
 - c. Pitt-Glaze WB1 Water-Borne Acrylic Epoxy (16-310) manufactured by PPG Industrial Coatings.

2.03 PRIMERS

- A. Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.

2.04 MIXING

- A. Mix multiple component materials in strict accordance with manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Galvanized Surfaces:
- E. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.
- F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

- A. Protect finished work from damage.

END OF SECTION 09 96 00

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Porcelain enamel steel markerboards.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

- A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
- D. Samples: Two, 2 by 2 inches in size illustrating materials and finish, color and texture of tackboard, tackboard surfacing, and trim.
- E. Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

- A. Porcelain Enamel Steel Markerboards:

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1. Manufacturers:
 - a. AJW Architectural Products: www.ajw.com/#sle.
 - b. ASI Visual Display Products: www.asi-visualdisplayproducts.com/#sle.
 - c. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
 - d. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Color: White.
 3. Frame: Extruded aluminum .
 4. Frame Profile: As indicated on drawings.
 5. Frame Finish: Anodized, natural.
 6. Accessories: Provide marker tray and map rail.

2.02 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Adhesives: Type used by manufacturer.

2.03 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
- B. Dry Marker Pens, Erasers: Manufacturer's standard. Provide full range of colors, two pens each color; one eraser each marker surface.
- C. Mounting Brackets: Concealed.

2.04 FINISHES

- A. Clear anodize, AAMA 611 AAM12C22A44.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 PREPARATION

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Refer to drawings for locations and mounting heights.
- C. Secure units level and plumb.

3.04 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 10 11 00

SECTION 10 22 19
DEMOUNTABLE PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud framing system.
- B. Partition Panels
- C. Millwork

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- B. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation.
- C. Section 09 65 00 - Resilient Flooring: Resilient base for application to demountable partitions.
- D. Section 09 91 23 - Interior Painting: On-site painting.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate layout, module joint locations, and special details associated with acoustic seals.
- C. Samples: Submit two samples 6 by 6 inch in size illustrating wall covering facing, trim colors and finish, and _____.
- D. Manufacturer's Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Demountable Gypsum Board Partitions:
 - 1. DIRTT; www.dirtt.com
 - 2. Falkbuilt Ltd; www.falkbuilt.com

2.02 DEMOUNTABLE GYPSUM BOARD PARTITIONS

- A. Partition System: Demountable, double sided, non-progressive, capable of four direction lateral expansion with reusable components.
 - 1. Module Width: As indicated on drawings.
 - 2. Partition Height: As indicated on drawings.

2.03 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- C. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
- D. Fasteners: Type recommended by system manufacturer.
- E. Panel Adhesive: Type recommended by system manufacturer.

2.04 PARTITION COMPONENTS

- A. Studs and horizontals: 16 gauge steel.
 - B. Track: 6063 T6 Aluminum
 - C. Cladding: As selected from manufacturer's standards.
 - D. Cladding Clips: 14 gauge steel.
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- E. Studs and Tracks: ASTM C645, sheet steel, 26 gauge, 0.0179 inch minimum thickness, C shaped, with serrated faces.

2.05 MILLWORK COMPONENTS

- A. Side panels: 3/4-inch thick MDF.
- B. Back panels: 5/8-inch thick MDF.
- C. Doors: 3/4-inch thick MDF.
- D. Drawers:
 - 1. Sides: Metal
 - 2. Bottom and Backs: 5/8-inch thick MDF.
- E. Cladding: As selected from manufacturer's standard.

2.06 FITTINGS AND HARDWARE

- A. Millwork Hardware:
 - 1. All hardware to be ligature-resistant.
 - 2. Cabinet pulls: Recessed.
 - 3. Hinges: Concealed.
 - 4. Locks: Tamper-proof.
 - 5. Drawer slides: soft-close.

2.07 ACCESSORIES

- A. TV Cabinet: Recessed, lockable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building conditions are ready to receive partitions and that field measured dimensions are as indicated on shop drawings.
- B. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION

- A. Install partitions before placement of carpet.
- B. Metal Stud Framing System:

1. Construct framing as indicated on drawings.
 2. Install studs in accordance with partition system manufacturer's installation instructions.
- C. Partition Panels:
1. Install panels in accordance with partition system manufacturer's instructions.
 2. Install panels in vertical direction; locate ends and edges over rigid support.
- D. Millwork: Install in accordance with partition system manufacturer's instructions.

3.03 TOLERANCES

- A. Maximum Variation from True Plane of Partition Surfaces: 1/8 inch in 10 feet in any direction.
- B. Maximum Variation from Dimensioned Locations: 1/4 inch in any direction.

3.04 ADJUSTING

- A. Adjust doors and frames to provide smooth door operation from open to closed position without gravity movement of door from any position.

3.05 PROTECTION

- A. Do not permit subsequent construction activities to cause damage to appearance or operation of installed partition components before Date of Substantial Completion.

END OF SECTION 10 22 19

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Corner guards fabricated from rolled metal sections or bent plate.
- B. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.
- D. Section 09 72 16.16 - Rigid Sheet Vinyl Wall Coverings

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
- E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

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- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Koroseal Interior Products: www.koroseal.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Protective Wall Covering:
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 1. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
 2. Width of Wings: As indicated on drawings.
 3. Corner: Square.
 4. Color: As selected from manufacturer's standard colors.
 5. Height: As indicated on drawings.
 6. Length: One piece.
- B. Protective Wall Covering:
 1. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
 2. Thickness: 0.060 inch.
 3. Color: As selected from manufacturer's standard colors.
 4. Accessories: Provide manufacturer's standard color-matched trim and moldings.
 5. Mounting: Adhesive.

2.04 ACCESSORIES

- A. Pre-manufactured Trim: Manufacturers standard rigid extruded vinyl.
- B. Adhesive: Type recommended by manufacturer to suit application, including primer/sealer.

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- C. Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl wallcovering for heat welding seams, in color matching field color.
 - D. Filler for Coved Base: Plastic.
 - E. Sealant: Type recommended by manufacturer to suit application, including primer/sealer.

2.05 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

2.06 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Semi-rigid wallcovering: Ensure wall surface flatness tolerance do not vary more than 1/8-inch in 10 foot nor vary at a rate greater than 1/16-inch per running foot.
- D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
 - 1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
 - 2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - 3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.

4. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
5. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
6. Use a roller to ensure maximum contact with adhesive.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 26 00

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Institutional ligature-resistant toilet accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Placement of reinforcement for backing plate reinforcement.
- B. Section 06 10 00 - Rough Carpentry: Placement of reinforcement
- C. Section 09 30 00 - Tiling: Ceramic washroom accessories.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).
- E. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. TAS - Texas Accessibility Standards; 2012.
- I. UL (ECMD) - Electrical Construction Materials Directory; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Bobrick Washroom Equipment, Inc; www.bobrick.com
 - 2. Bradley Corporation: www.bradleycorp.com/#sle.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Institutional Security and Ligature-Resistant Toilet and Bath Accessories:
 - 1. Behavioral Safety Products, www.besafeprod.com
 - 2. Gojo Industries, Inc.: <http://gojo.com>.
 - 3. Inpro: www.inprocorp.com/#sle.
 - 4. Kingsway Group: www.kingswaygroupglobal.com
 - 5. Whitehall Manufacturing: www.whitehallmfg.com/#sle.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

- A. The structural strength of grab bars, tub and shower seats, fasteners, and mounting devices shall meet the following specifications:
 - 1. Shear force induced in a fastener or mounting device from the application of 250 lbf shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.
 - 2. Tensile force induced in a fastener by a direct tension force of 250 lbf plus the maximum moment from the application of 250 lbf shall be less than the allowable withdrawal load between the fastener and the supporting structure.

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- B. Products Requiring Electrical Connection: Listed and classified by UL (ECMD) as suitable for the purpose specified and indicated.
 - C. Perform electrical work in accordance with NFPA 70.

2.03 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.04 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

2.05 COMMERCIAL TOILET ACCESSORIES

- A. Refer to drawings for basis of design products.

2.06 INSTITUTIONAL SECURITY AND LIGATURE-RESISTANT TOILET AND BATH ACCESSORIES

- A. Refer to drawings for basis of design products.
- B. Toilet Paper Holder: Single roll, recessed unit with beveled wall flange, white powder coated stainless steel, spring-loaded spindle button type for standard toilet paper rolls. Install with tamper-resistant screws.
- C. Paper Towel Holder: Folded paper type, single bay, satin finish stainless steel, surface-mounted. Install with tamper-resistant screws.
 - 1. Capacity: 250 C-fold minimum per bay.

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- D. Mirrors: Stainless steel framed, Type 400 polished stainless steel mirror; exposed front mount.
 - 1. Framed Size: 24 inches by 36 inches.
 - 2. Frame: White powder coated stainless steel with mitered beveled edges and welded and ground corners, and tamperproof hanging system; Rounded corners.
 - E. Grab Bars: Type 304 stainless steel, smooth surface with closure plate.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, 1-1/2 inch clearance between wall and inside of grab bar; 14 gauge stainless steel "L" shaped closure plate with wall mounting flange welded to bottom of tube to prevent ligature. Install grab bar and closure plate with tamper-resistant screws through grab bar circular mounting flange and wall flange of flat closure.
 - c. Length and Configuration: As indicated on drawings.
 - F. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with ABS plastic cover; battery operated, touch-free dispensing, and window gauge refill indicator, tamper proof lock.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section 06 10 00 and 09 21 16 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 - 1. Comply with TAS and ADA Standards.
 - 2. Grab Bars: As indicated on drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 2. Nystrom, Inc: www.nystrom.com/#sle.

3. Potter-Roemer: www.potterroemer.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:

1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.

2. Nystrom, Inc: www.nystrom.com/#sle.

3. Potter-Roemer: www.potterroemer.com/#sle.

4. Safety One Industries; www.safetyone.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.

1. Class: A:B:C type.

2. Size: 10 pound.

3. Finish: Baked polyester powder coat, red color.

4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Configuration: Recessed type.

1. Size to accommodate accessories.

2. Trim: Flat square edge, with 1/4 inch wide face.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity lockable with recessed pulls. Hinge doors for 180 degree opening with continuous piano hinge.

D. Door Glazing: Polycarbonate plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION 10 44 00

SECTION 10 51 13
METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lockers.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood base construction.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- E. TAS - Texas Accessibility Standards; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Samples: Submit two samples 3 by 6 inches in size showing color and finish of metal locker material.
- E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 REGULATORY REQUIREMENTS

- A. Meet applicable requirements of the following organizations unless specific conflicting standards are referenced in this Section.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition.

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- C. TAS - Texas State Accessibility Standards, of the Architectural Barriers Act, Article 9102, Applicable State Civil Statutes, effective March 15, 2012.
 - D. Provide one accessible locker within each bank of lockers in compliance with the above requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lockers:
 - 1. ASI Storage Solutions: www.asi-storage.com/#sle.
 - 2. Lyon Workspace Products: www.lyonworkspace.com/#sle.
 - 3. Penco Products, Inc: www.pencoproducts.com/#sle.
 - 4. Republic Storage Systems Co: www.republicstorage.com/#sle.

2.02 LOCKER APPLICATIONS

- A. Staff Lockers: Metal lockers, wall mounted for base indicated on drawings.
 - 1. Size: As indicated on drawings.
 - 2. Configuration: Two tier.
 - 3. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Hooks: One single prong.
 - 4. Ventilation: Louvers at top and bottom of door panel.
 - 5. Locking: Padlock hasps, for padlocks provided by Owner.
 - 6. Color: To be selected from manufacturer's full range by Architect.

2.03 METAL LOCKERS

- A. Accessibility: Design units indicated on drawings as 'accessible' to comply with ICC A117.1 and ADA Standards.
- B. Locker Case Construction:

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1. Heavy-Duty, Welded Construction: Made of formed and welded together sheet steel; metal edges finished smooth without burrs; powder coat finished inside and out.
 - a. Assembly: Do not use bolts, screws, or rivets to assemble locker bodies.
 - b. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
 - 1) Unperforated Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M and the
 - c. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 - 1) Door Frame: 16 gauge, 0.0598 inch, minimum.
 - d. Where ends or sides are exposed, provide flush panel closures.
 - e. Provide filler strips where indicated or required, securely attached to lockers.
 - C. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
 1. Door Thickness: 16 gauge, 0.0598 inch, minimum.
 2. Form recess for operating handle and locking device.
 - D. Latches and Door Handles: Manufacturer's standard.
 - E. Hinges: Continuous piano hinge with powder coat finish to match locker color.
 - F. Coat Hooks: Stainless steel or zinc-plated steel.
 - G. Locks: Locker manufacturer's standard type:
 1. Factory installed padlock hasp.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.

- D. Install fittings if not factory installed.
- E. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION 10 51 13

SECTION 10 51 23
PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plastic-laminate-clad lockers.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood base construction.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ANSI A208.1 - American National Standard for Particleboard; 2022.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- E. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- G. TAS - Texas Accessibility Standards; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Samples: Two 3 by 6 inches in size, of each color scheduled.
- E. Manufacturer's Instructions: Indicate component installation assembly.

1.05 REGULATORY REQUIREMENTS

- A. Meet applicable requirements of the following organizations unless specific conflicting standards are referenced in this Section.

- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition.
- C. TAS - Texas State Accessibility Standards, of the Architectural Barriers Act, Article 9102, Applicable State Civil Statutes, effective March 15, 2012.
- D. Provide one accessible locker within each bank of lockers in compliance with the above requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic-Laminate-Clad Lockers:
 - 1. Case Systems: www.casesystems.com/#sle.
 - 2. Hollman, Inc: www.hollman.com/#sle.
 - 3. Ideal Products, Inc: www.ideallockers.com/#sle.

2.02 LOCKER APPLICATIONS

- A. Patient Lockers: Plastic-laminate-clad lockers, wall mounted for base indicated on drawings.
 - 1. Size: As indicated on drawings.
 - 2. Locker Configuration: Two-tier or Four-tier as indicated on drawings.
 - 3. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - 4. Locking: Built-in digital keypad locks.
 - 5. Plastic Laminate Color: As selected from manufacturer's full range

2.03 PLASTIC-LAMINATE-CLAD LOCKERS

- A. Accessibility: Design units indicated on drawings as 'accessible' to comply with ICC A117.1 and ADA Standards.
 - B. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
 - C. Lockers: Factory assembled, made of plastic-laminate-faced panels: fully finished inside and out; each locker capable of standing alone.
 - 1. Doors and Panels: Plastic laminate adhesive and pressure bonded to faces and edges of particleboard core, with beveled corners and edges; edges of cut-outs sealed.
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- a. Particleboard for Core: ANSI A208.1 composed of wood chips, sawdust or flakes, made with waterproof resin binder; grade to suit application; sanded faces.
 - b. Plastic Laminate: NEMA LD 3, HGS.
 - c. Adhesive: Contact type.
2. Doors: Full overlay, covering full width and height of locker body.
 - a. Style: Flat panel.
 3. Locker Body Construction: Manufacturer's standard for selected product.
 4. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
 5. Provide filler strips where indicated, securely attached to lockers.
- D. Component Thicknesses:
1. Doors: 3/4 inch minimum thickness.
 2. Locker Body: Tops, bottoms, sides, and shelves 3/4 inch; backs 1/2 inch; minimum.
 3. End Panels and Filler Panels: 1/2 inch minimum thickness.
 4. Toe Kick Plates: 1/2 inch minimum thickness.
- E. Hinges: Full height of locker, manufacturer's standard heavy duty type.
- F. Built-In Digital Keypad Locks: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Install end panels, filler panels, and sloped tops.
- E. Install fittings if not factory installed.
- F. Replace components that do not operate smoothly.

3.03 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean locker interiors and exterior surfaces.

END OF SECTION 10 51 23

SECTION 10 73 26
WALKWAY COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-engineered, pre-finished extruded metal walkway coverings.

1.02 RELATED REQUIREMENTS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- F. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- G. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.
- H. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2023.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Metal Product Data: Product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, footings, anchorage, size and type of fasteners, deck panels, cross sections, and trim details clearly indicating proper assembly.

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- D. Samples, Metal Components: Two samples, minimum size 2 by 3 inches, representing actual material and finish of exposed metal.
 - E. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
 - F. Manufacturer's Instructions:
 - 1. Storage and handling requirements and recommendations.
 - 2. Preparation instructions and recommendations.
 - 3. Installation methods.
 - G. Designer's qualification statement.
 - H. Manufacturer's qualification statement.
 - I. Executed warranty.
 - J. Specimen warranty.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of factory-applied finishes. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
 - 1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
 - 2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
 - 3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.
- C. Correct defective Work within a two year period after Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all walkway coverings from a single manufacturer.
- B. Metal Walkway Coverings:
 - 1. AVAdek Walkway Covers & Canopies: www.avadek.com/#sle.
 - 2. C.R.Laurence Co., Inc.: www.crlaurence.com
 - 3. East Texas Canopy, Inc.: www.easttexascanopy.com
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WALKWAY COVERINGS - GENERAL

- A. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection in accordance with ASCE 7.
 - 1. Thermal Movement: Plus/minus 1/8 inch, maximum.
- B. Configuration: Column layout, walkway clearance, fascia profile, and roof covering design as indicated on drawings.
 - 1. Drainage Concept: Water collected in decking conducted into perimeter drain beams and discharged through columns.
 - 2. Decking Orientation: As indicated on drawings.
- C. Provide a complete system ready for erection at project site.
- D. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 METAL WALKWAY COVERINGS

- A. Protective Covers: Pre-engineered, pre-finished extruded aluminum frame assembly, interlocking deck sections secured with screws, and fascia.
 - 1. Structural Performance: Capable of withstanding design loads specified by applicable building code .
 - 2. Drainage: Self-draining from deck through bents to discharge point at ground level or as otherwise shown.
- B. Type: Attached to structure, as indicated on drawings.
- C. Beams: Open top aluminum tubular extrusions of size as required by structural engineering design.

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- D. Columns: Extruded aluminum, designed for concealed drainage from beams to deck level.
 - E. Framework: Aluminum.
 - F. Water Management: Drain beams and internal column drains with drainage outlet on grade.
 - G. Deck: Rigid-Roll-Lock extruded aluminum, self-flashing, interlocking sections of size and profile as required by structural engineering design.
 - 1. Provide welded end plate water dams where sections terminate at other than drainage channels.
 - 2. Finish: Fluoropolymer coating.
 - 3. Color: Match Architect's sample.
 - H. Fascia: Manufacturer's standard extruded aluminum fascia sections as shown on drawings.
 - 1. Finish: Fluoropolymer coating.
 - 2. Color: Custom color as selected by architect.
 - I. Hanger Rods: 3/4 inch diameter rods and attachment hardware, hot-dip galvanized.
 - J. Wall Brackets: Fabricated from stainless steel or aluminum and designed to receive and anchor the hanger rods to the substructure.

2.04 COMPONENTS

- A. Aluminum Framing:
 - 1. Columns: Extruded aluminum.
 - 2. Beams: Extruded aluminum.
 - 3. Decking: Self-flashing, interlocking sections.
 - 4. Fascia Extruded aluminum.
- B. Exposed Framing Fasteners: Flush countersunk stainless steel screws or bolts; consistent with design of system and acceptable to manufacturer.
 - 1. Decking Fasteners: Stainless steel with neoprene washers.
 - 2. Finish exposed fasteners to match metal frame.
- C. Flashings: Metal and finish matching system framing components, with thickness as recommended by manufacturer for conditions encountered.

2.05 MATERIALS

A. Aluminum:

1. Aluminum Extrusions: Alloy and temper 6063-T5, 6063-T6, or 6061-T6 members complying with ASTM B221 (ASTM B221M), with minimum thickness 1/8 inch for structural members and 1/16 inch for nonstructural members.
2. Formed Aluminum: Sheet material of alloy 5052, 5005, or 6061-T651 members complying with ASTM B209/B209M, with minimum thickness 1/8 inch for structural members and 1/16 inch for nonstructural members.

2.06 FABRICATION - METAL COMPONENTS

- A. Fit and shop assemble components in largest practical sizes, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.
- E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- F. Accurately form components to suit each other and to building structure.

2.07 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605, multiple coats, thermally cured polyvinylidene fluoride system.
- B. Finish Color: As selected by Architect to match sample.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Examine footings in which bents will be set. Verify footing locations and elevations comply with shop drawings.
- C. Verify that foundation, electrical utilities, and placed anchors are in correct position.
- D. Verify that bearing surfaces are ready to receive this work.
- E. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete with setting templates for installation of work in other sections.

3.03 INSTALLATION - FRAMING

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide anchors required for connecting framing to structure. Anchor framing to structure.
- D. Field weld anchors as indicated on drawings. Grind welds smooth. Touch-up welds with primer.
- E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Keep aluminum surfaces from direct contact with ferrous metal or other incompatible materials by applying one coat of zinc chromate primer; follow with two coats of aluminum paint.
 - 1. In lieu of aluminum paint, one coat of high-build bituminous paint applied to 1/16 inch thickness may be used.

3.04 INSTALLATION - METAL COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal decking to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 TOLERANCES

- A. Maximum Variation from Plumb, Level, or Line: 1/8 inch per 10 feet, or 3/8 inch total in overall dimension.
- B. Alignment of Two Adjoining Members Abutting in Plane: Within 1/16 inches.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
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- B. Test for watertightness, water management, and lack of ponding of completed walkway covering and components, including decking, drain beams, and columns.

3.07 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove surplus materials and debris from the site.
- C. Clean all exposed surfaces after installation.

3.08 PROTECTION

- A. Touch-up, repair, or replace damaged components before Date of Substantial Completion.
- B. Protect walkway covering after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION 10 73 26

SECTION 11 05 00
COMMON WORK RESULTS FOR EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Equipment
- B. Connection to utilities

1.02 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; 2021.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL (BMD) - Building Materials Directory; current edition.
- D. UL (ECMD) - Electrical Construction Materials Directory; current edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads .
- C. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required
- D. Samples: Submit two samples of exposed finish surfaces, 6 x 6 inch in size illustrating color and finish.
- E. Manufacturer's Installation Instructions: Indicate special installation requirements .
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Operation Data: Include description of equipment operation and required adjusting and testing .
- H. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.

- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., UL (ECMD) as suitable for the purpose specified and indicated.
- C. Products Requiring Fire Resistance Rating: Listed and classified by UL (BMD).
- D. Perform electrical work in accordance with NFPA 70.

1.06 COORDINATION

- A. Leave building openings of sufficient size to permit transport of equipment to final position.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

1.08 SCHEDULED EQUIPMENT

- A. Arrangement: Specified items of equipment are arranged and scheduled into several categories. Such categories shall not be considered to establish scope or limits of Work required. Terms and conditions of such limitation shall lie between Contractor and subcontractors.
 - B. Owner Furnished-Owner Installed (OFOI) Equipment
 - 1. Owner will deliver equipment to jobsite and to its designated location.
 - 2. Owner will install equipment.
 - 3. Contractor shall make final utility connections.
 - C. Owner Relocated-Owner Installed (OROI) Equipment
 - 1. Owner will relocate existing equipment to its designated location.
 - 2. Owner will install equipment.
 - 3. Contractor shall make final utility connections.
 - D. Owner Furnished-Contractor Installed (OFCI) Equipment
 - 1. Vendor will deliver equipment to jobsite.
-

2. Contractor shall receive equipment and deliver equipment to its designated location.
 3. Contractor shall install equipment and make final utility connections.
 4. Exact equipment has not yet been selected. Contractor shall obtain submittal data from Owner for Contractor-installed equipment before rough-ins are made. Contractor shall coordinate with Owner the schedule for Owner-furnished equipment data.
- E. Contractor Relocated-Contractor Installed (CRCI) Equipment
1. Contractor shall disconnect existing equipment and relocate equipment to its designated location.
 2. Contractor shall install equipment and make final utility connections.
 3. Staging: Relocation of existing equipment will be performed according to Owner's relocation schedule, yet to be developed. Owner's operations shall not be jeopardized by untimely relocation of existing equipment.
- F. Contractor Furnished-Contractor Installed (CFCI) Equipment
1. Contractor shall deliver equipment to jobsite and to its designated location.
 2. Contractor shall install equipment and make final utility connections.
- G. Owner Furnished-Vendor Installed (OFVI) Equipment
1. Owner will deliver equipment to jobsite and to its designated location.
 2. Vendor will install equipment.
 3. Contractor shall make final utility connections.
- H. Vendor Relocated-Vendor Installed (VRVI) Equipment
1. Vendor will relocate existing equipment to its designated location.
 2. Vendor will install equipment.
 3. Contractor shall make final utility connections.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Refer to Drawings

2.02 COMPONENTS

- A. Motors: NEMA MG 1 type. Specific motor type is specified in individual specification sections and equipment data.
- B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough-in frames, anchors and supports are accurately placed.

3.02 PREPARATION

- A. Provide rough-in frame and anchors for placement by other trades.

3.03 INSTALLATION

- A. Install in accordance with manufacturers's instructions. Use skilled workers familiar with items and installation requirements.
- B. Install in accordance with standards required by authority having jurisdiction.
- C. Anchor equipment securely in place, plumb, square and in line. Anchor securely to base. Anchor to wall with anchor devices.
- D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- E. Touch-up minor damaged surfaces caused during installation. Replace damaged components as directed by Architect.

3.04 ADJUSTING

- A. Adjust operating equipment to efficient operation.

3.05 CLEANING

- A. Protect installed products until completion of project.
- B. Clean equipment and apparatus with products recommended by manufacturer.
- C. Remove masking or protective covering from stainless steel and other finished surfaces.

3.06 CLOSEOUT ACTIVITIES

- A. Demonstrate equipment operation and maintenance procedures.
-

END OF SECTION 11 05 00

SECTION 11 19 19
SURFACE PADDING SYSTEM

SURFACE PADDING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface padding system for floors, walls, doors and frames.

1.02 RELATED SECTIONS

- A. Division 08: Doors and Frames
- B. Section 09 21 16 - Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.
- C. Shop Drawings:
 - 1. List of materials, thickness of materials, elevations, sections, and details.
- D. Samples: Submit two samples, minimum 3" x 3" of resilient padding.
- E. Manufacturer's Installation Instructions
- F. Maintenance information regarding the proper care and maintenance of surface padding system.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Engage an experienced installer with minimum five (5) years-experience and approved by the manufacturer as having the necessary experience, staff and training to install product.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport and handle resilient cell padding panels to prevent damage.
- B. Store materials in building on platform above floor and cover with tarps. Store joint filler liquid padding material in original containers in a well-ventilated area away from fire and flame.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
- B. Environmental Conditions: Maintain a minimum temperature of 65 degrees F, 36 hours before installation, during installation and until materials have fully cured as mandated by manufacturer.
- C. Ventilation: Provide adequate ventilation during installation and curing time.
- D. Flammability: No smoking, open flames or sparking from electrical equipment shall be permitted in the area during storage and application of material.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide cell padding system with the following surface burning characteristics as determined per ASTM E84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction
 - 1. Flame-Spread Index: 10 or less.
 - 2. Smoke-Developed Index: 160 or less.
 - B. Miscellaneous Characteristics
 - 1. Critical Radiant Flux of Floor Covering Systems: Class I, >0.99 in accordance with ASTM E684.
 - 2. Tensile Strength Range: 300 psi minimum in accordance with ASTM D412.
-

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3. Hardness Range: 60 ± 5 , Class D.
 4. Compression Deflection: 4 psi @ 25% deflection per ASTM D1056.
 5. Temperature Stability: Unaffected between 20 to 120 degrees F.
 6. Moisture Absorption: Maximum 1.05% by weight.
 7. Fungus Resistance: 0 per ASTM G21
 8. Compression: 90% recovery after 72 hours.
 9. Elongation at Break: 150%.

2.02 MANUFACTURERS

- A. Subject to compliance with requirements, provide named manufacturer product or pre-approved equal.
- B. B & E Surfaces
- C. Marathon Engineering Corporation: www.goldmedalsafetypadding.com
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Fasteners: As recommended by padding manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspect surface to receive work under this section. Notify the architect in writing if surface is not satisfactory for application of materials. Commencement of work constitutes acceptance of surface.
- B. Clean wall surface prior to padding installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. All vertical panels will be mechanically fastened to walls.
- C. The number of fasteners per panel will be determined by the installers and is based on type of substrate.
- D. Fill gaps between panels with compound provided by manufacturer for this purpose.
- E. Fill fastener holes with color-matched compound and sand.

- F. At penetrations of padding system for plumbing fixtures, air diffusers, lighting fixtures and security devises, coordinate with requirements of the respective trades for correct mounting.
- G. Provide openings for glazed observation windows in doors.

3.03 CLEANING

- A. Clean work area of debris resulting from installation.
- B. Clean surface with mild, non-abrasive liquid detergent.

3.04 PROTECTION

- A. Protect finished work until Substantial Completion.

END OF SECTION 11 19 19

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 83 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator: Free-standing, top-mounted freezer, and frost-free.

-
1. Capacity: Total minimum storage of 16.6 cubic ft; minimum 15 percent freezer capacity.
 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 3. Features: Include glass shelves, light in freezer compartment, sliding deli drawer, adjustable wire freezer shelf, and factory-installed icemaker.
 4. Exterior Finish: Stainless steel.
 5. Manufacturers:
 - a. GE Appliances: www.geappliances.com/#sle.
 - 1) Basis of Design: Model No. GIE17GSRSS

2.02 LAUNDRY APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
 - B. Clothes Washer: Front-loading.
 1. Size: Large capacity.
 2. Controls: Solid state electronic.
 3. Cycles: Include normal, permanent press, delicate, rinse & spin, spin only, and heavy duty.
 4. Finish: Painted steel , color white.
 5. Manufacturers:
 - a. GE Appliances: www.geappliances.com/#sle.
 - 1) Basis of Design Model No. LFNE5BSP115TW01
 - C. Clothes Dryer: Electric, stationary.
 1. Size: Large capacity.
 2. Controls: Solid state electronic, with electronic moisture-sensing dry control.
 3. Temperature Selections: Three.
 4. Cycles: Include normal, permanent press, knit/delicate, and quick dry.
 5. Features: Include interior light, reversible door, end of cycle signal, and time-remaining display.
 6. Finish: Painted steel , color white.
-

7. Manufacturers:

a. GE Appliances: www.geappliances.com/#sle.

1) Basis of Design Model No. LDEE5BGS173TW01

D. Stackable Washer-Dryer: Front-loading.

1. Washer:

a. Size: Large capacity.

b. Controls: Solid state electronic.

c. Cycles: Include normal, permanent press, delicate, rinse & spin, spin only, and heavy duty.

d. Finish: Painted steel , color white.

2. Clothes Dryer: Electric, stationary.

a. Size: Large capacity.

b. Controls: Solid state electronic, with electronic moisture-sensing dry control.

c. Temperature Selections: Three.

d. Cycles: Include normal, permanent press, knit/delicate, quick dry, and time dry.

e. Features: Include end of cycle signal and time-remaining display.

f. Finish: Painted steel , color white.

3. Manufacturers:

a. GE Appliances: www.geappliances.com/#sle.

1) Basis of Design Model No. LTEE5ASP175TW01

b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 11 30 13

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the placement of concealed blocking to support blinds. See Section 05 50 00 and 06 10 00.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Horizontal Louver Blinds:
 - 1. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
 - 2. Levolor: www.commercial.levolor.com/#sle.
 - 3. SWFcontract, a division of Springs Window Fashions, LLC: www.swfcontract.com/#sle.

2.02 BLINDS

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
- C. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
 - 1. Width: ___ inch.
 - 2. Color: As selected by Architect.
- D. Slat Support: Woven polypropylene cord, ladder configuration.
- E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
- F. Headrail Attachment: Wall brackets.

2.03 FABRICATION

- A. Determine sizes by field measurement.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed. See Section 05 50 00 and 06 10 00.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

- A. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy.

END OF SECTION 12 21 13

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- B. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, and mounting dimension requirements for each product and condition.
- C. Selection Samples: Include fabric samples in full range of available colors and patterns.
- D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

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- F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
 - G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: Ten years.
 - 2. Fabric: Twenty-five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc: www.draperinc.com/#sle.
 - 2. MechoShade Systems LLC: www.mechoshade.com/#sle.
 - 3. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

- A. General:

-
1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
1. Description: Single roller, manually operated fabric window shades.
 - a. Drop Position: Regular roll.
 - b. Mounting: Window jamb mounted.
 - c. Size: As indicated on drawings.
 - d. Fabric: As indicated under Shade Fabric article.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Steel, 1/8 inch thick.
 3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 lb in the stopped position.
-

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- c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
 - 6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
 - 7. Accessories:
 - a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
 - 1) Color: As selected.
 - 2) Profile: Square.
 - 3) Configuration: Captured; fascia stops at bracket end.
 - b. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

- A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Material: Vinyl coated polyester.
 - 2. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 - 3. Roll Width: 72 inches.
 - 4. Color: As selected by Architect from manufacturer's full range of colors.
 - 5. Fabrication:
 - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

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- C. Dimensional Tolerances: As recommended in writing by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 12 24 00

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- 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. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

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- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
 - G. Installation Instructions: Manufacturer's installation instructions and recommendations.
 - H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD 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.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide ten year manufacturer warranty for solid surfacing material.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

-
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. NSF approved for food contact.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 5. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

- A. Wood-Based Components:
 1. Wood fabricated from old growth timber is not permitted.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, white.
- D. Solvent: Product recommended by manufacturer to clean surfacing materials to assure adhesion of adhesives, fillers and sealants.
- E. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.

2.03 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets:
- B. Countertop Wall Brackets, Concealed: Minimum 0.25 inch thick steel, formed 2 inch wide flanges with pre-punched 0.39 inch square mounting holes; without upper extension; black textured powder coating finish; including mounting bolts, nuts, and washers.
 1. Size: To suit application.
 2. Manufacturer:
 - a. A & M Hardware, Inc.; www.AandMhardware.com.

-
- b. Richelieu: Triade concealed bracket; www.richelieu.com
 - c. U.S. Futaba, Inc.: www.usfutaba.com.

2.04 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 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.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 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.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Install solid surfacing materials with mounting adhesive in accordance with adhesive manufacturer's recommendations.
 - 1. Joint Treatment Between Adjacent Pieces:
 - a. Set joints flush, tight fitting, level and neat.
 - b. Tool joint filler into joints according to manufacturer's printed instructions. Tool filler surface to flush profile.
- C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 36 00

SECTION 12 48 13
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet mat.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating properties of walk-off surface, component dimensions.
- C. Shop Drawings: Indicate dimensions.

PART 2 PRODUCTS

2.01 MATS

- A. Carpet Mat: Cut nylon pile permanently bonded to rubber backing; size as scheduled, with one inch black matching rubber border on all edges.
 - 1. Colors: As indicated on drawings.

2.02 FABRICATION

- A. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install walk-off surface after cleaning of finish flooring.

END OF SECTION 12 48 13

SECTION 20 05 13 – MOTORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Perform all Work required to provide and install high efficiency single- and three-phase electric motors required for equipment supplied under this division of Work as indicated by the Contract Documents, with supplementary items necessary for proper installation. Refer to Electrical Drawings for motor starter sizes. Disconnect switches to be furnished in Division 26.
- B. The Fire Suppression, Plumbing and HVAC Subcontractor shall furnish starters for Fire Suppression, Plumbing and HVAC Work. Motor starters shall be provided in accordance with Division 26 Specifications. Some motors furnished in mechanical equipment rooms shall have starters furnished and installed as part of Division 26 (as per Specification Section 26 29 14, Motor Starters). Coordinate with Division 26.
- C. Motors rated at less than 190 Watts and intended for intermittent operation need not conform to these Specifications.
- D. ECM (Electronically Commutated Motor) motors on terminal units, fan-coil units, and computer room air conditioning units are except from specification requirements that can not apply due to different electrical design characteristics.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
 - 2. AFBMA 11 – Load Ratings and Fatigue Life for Roller Bearings.
 - 3. EISA - The Energy Independence & Securities Act 2007.
 - 4. ANSI/IEEE 112 – Test Procedure for Polyphase Induction Motors and Generators.
 - 5. ANSI/NEMA/ MG 1 – Motors and Generators Part 31.

6. NFPA 70 – National Electrical Code.
7. ANSI C19 – Industrial Control Apparatus.
8. NEMA ICS – Industrial Control and Systems.
9. NEMA RV 3 - Application and Installation Guidelines for Flexible and Liquidtight Flexible Metal and Nonmetallic Conduits
10. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
11. NEMA FB 2.20 - Selection and Installation Guidelines For Fittings for Use With Flexible Electrical Conduit and Cable
12. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
13. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports
14. NEMA OS 3 - Selection and Installation Guidelines for Electrical Outlet Boxes
15. UL 508 – Industrial Control Equipment.
16. ANSI/IEEE 117 – Standard Test Procedure for Evaluation of Systems of Insulating Materials for Random Wound AC Electric Machinery.
17. ANSI/NEMA MG 2 – Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors.
18. ANSI/UL 674 – Electric Motors and Generators for Use in Hazardous (Classified) Locations.
19. ANSI/UL 1004 – Electric Motors.

1.04 QUALITY ASSURANCE

- A. Motors associated with variable frequency drives (VFD) shall be inverter-duty rated, and provided with grounded shaft or ceramic bearings to insulate shaft, and Class F 105 degrees C rise insulation. Ref. NEMA MG1 Part 31.
- B. Conform to NFPA 70.

1.05 SUBMITTALS

- A. All motors provided by the Contractor shall be of the same manufacturer unless they are an integral part of the piece of equipment to which they are attached.
- B. Product Data: Provide the following information for each motor:
 1. Manufacturer.
 2. Rated full load horsepower.
 3. Rated volts.
 4. Number of Phases.

5. Insulation Class.
 6. Frequency in Hertz.
 7. Full load amperes (FLA).
 8. Locked rotor amperes (LRA) at rated voltage or NEMA code letter.
 9. Nominal speed at full load (rpm).
 10. Service factor.
 11. NEMA design letter.
 12. NEMA machine type (ODP, WP-I, TEFC, etc.).
- C. For motors one horsepower and larger, include the following additional information:
1. NEMA frame size.
 2. NEMA insulation system classification. For motors required to be installed outdoors, include information showing compliance for outdoor application.
 3. Maximum ambient temperature for which motor is designed.
 4. Time rating.
 5. Bearing size and type data.
 6. Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0% load.
- D. For motors 20 horsepower and larger, include the following additional information:
1. No load amperes.
 2. Safe stall time.
 3. Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0% load.
 4. Motor manufacturer's recommended maximum power factor correction capacitor (kvar) that can safely be switched with the motor.
 5. Expected value of corrected power factor at no load, 50 percent, 75 percent and full load.
 6. Full load amperes with corrected power factor.
 7. Maximum guaranteed slip at full load.
- E. Operation and Maintenance Data:
1. Submit operation and maintenance data including assembly Drawings, bearing data including replacement sizes, and lubrication instructions.
- F. Alternate Motors:

1. If a motor horsepower rating larger than indicated is offered as a substitute and accepted, provide required changes in size of conductors, conduits, motor controllers, overload relays, fuses, circuit breakers, switches and other related items at no change in the Contract price.

1.06 WARRANTY

- A. Provide minimum one-year manufacturer's warranty including coverage for motors one horsepower and larger.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Electrical Service: Refer to Drawing schedules for required electrical characteristics.
- C. Design for continuous operation in 40 degrees C environment and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, Service Factor and motor enclosure type.
 1. Totally Enclosed Motors: Design for a service factor of 1.00 and an 80 degrees C maximum temperature rise in the same conditions.
 2. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.
- D. Visible Stainless Steel Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, Service Factor, Power Factor, efficiency.
- E. Electrical Connection: Provide adequately sized metal electrical connection box for conduit connection. For fractional horsepower motors where connection is made directly, provide metal electrical box for conduit connection.
- F. Motors shall be built in accordance with the latest ANSI, IEEE and NEMA Standards and shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics scheduled and of approved manufacturer as listed below or of the same manufacturer as the equipment which they serve. Nameplate rating of motors shall match the characteristics scheduled.
- G. All motors shall be designed for normal starting torque unless the driven machine requires high starting torque and shall be selected for quiet operation, free from magnetic hum.
- H. All motors shall be provided with adequately sized electrical connection box for attachment of flexible conduit. Paragraph 1.03 of this specification refers to the NEMA standards and publications relevant to applications and use of both metal and liquid tight flexible conduit. When motors are connected to driven equipment by the use of a V-belt drive, they shall be furnished with adjustable rails.

- I. All air handling unit motor(s) with single and fan array arrangements, exhaust fan motors, chilled and hot water pump motors shall be compatible with variable frequency drive controllers. Equipment manufacturer shall coordinate with VFD manufacturer to ensure compatibility. Characteristics of motors furnished on equipment shall be furnished to VFD manufacturer for review, prior to installing motor on equipment. VFD's shall be furnished with driven equipment and shall be run tested as an equipment unit at factory prior to shipment. Submit run test report prior to shipping. F.O.B. of motors to factory shall be by the equipment manufacturer.
- J. Motors shall be open drip-proof type, except where specified or noted otherwise on the construction drawing.
- K. Motors $\frac{1}{4}$ to $\frac{3}{4}$ hp shall be Subtype II and meet the minimum requirements of EPA92 for minimum NEMA nominal efficiency motors.
- L. Motors 1 to 200 hp shall be Subtype I and meet the minimum requirements of NEMA Table 12-12 for NEMA premium efficiency motors.

2.02 MANUFACTURERS

- A. Manufacturer: Company specializing in the manufacture of electric motors for HVAC and plumbing equipment use, and their accessories, with minimum three (3) years documented product development, testing and manufacturing experience.
 - 1. Baldor - Super E – NEMA Premium Efficiency.
 - 2. Marathon - NEMA Premium Efficiency.
 - 3. Siemens – NEMA Premium Efficiency U.S. Electrical – NEMA Premium Efficiency.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.
- F. Single phase motors, shall be less than $\frac{3}{4}$ horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors with dripproof enclosures except as hereinafter specified. These motors shall have built-in thermal overload protection and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.

- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum Service Factor as specified herein, prelubricated sleeve or ball bearings, automatic reset overload protector.
- E. Single phase motors shall be less than 3/4 horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors. These motors shall have built-in thermal overload protection with automatic reset and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Enclosures shall be of the open dripproof type with a service factor as specified herein and Class B insulation rated at 90 degrees C temperature rise measured above 40 degrees C room ambient condition at full load, unless otherwise noted.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.
- H. Single phase motors, in general, shall be less than 3/4 horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors. These motors shall have built-in thermal overload protection and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.06 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Enclosures shall be of the open drip proof type with a service factor as specified herein and Class B insulation rated at 90 degrees C temperature rise measured above 40 degrees C room ambient condition at full load, unless otherwise noted.
- B. All motors 3/4 horsepower and larger, unless smaller motors are indicated to be supplied as 3-phase, shall be 3-phase and shall be squirrel cage high efficiency induction type with standard NEMA frame sizes.
- C. Three phase motors not connected to variable frequency drives are to be protected for phase loss and phase unbalance protection.
- D. Motors 1 HP and larger shall have integral frames.
- E. Starting Torque: Between one and one and one-half times full load torque.
- F. Starting Current: Six times full load current.
- G. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.

- H. Design, Construction, Testing and Performance: Conform to ANSI/NEMA MG 1 for Design B motors.
- I. Insulation System: NEMA Class B or better.
- J. Testing Procedure: In accordance with ANSI/IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data.
- K. Motor Frames: NEMA standard T-frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- L. Bearings:
 - 1. Ball or roller type, double shielded with continuous grease relief to accommodate excessive pressure caused by thermal expansion or over lubrication.
 - 2. All motor bearings shall be factory prepacked with a nondetergent lubricant and shall be provided with lubrication fitting arranged to provide easy access when installed on the driven apparatus except as noted hereinafter.
 - 3. Permanently lubricated factory-sealed motors may be provided in fractional horsepower sizes only where they are an integral part of a piece of approved apparatus.
 - 4. All bearings shall be designed for L-10, 40,000 hour minimum life hours of continuous service. Calculate bearing load with NEMA minimum V-belt pulley with belt centerline at end of NEMA standard shaft extension. Direct driven fans may require specific bearings other than ball type, verify equipment specification where motor may be used where bearing life requirement may exceed L-10 rating. Stamp bearing sizes on nameplate.
- M. Sound Power Levels: Refer to ANSI/NEMA MG 1.
- N. Part Winding Start (Where Indicated): Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel. Bearings shall be double shielded with waterproof non-washing grease.
- O. Nominal Efficiency and Power Factor: Meet or exceed values as scheduled at load and rated voltage when tested in accordance with ANSI/IEEE 112.
- P. Motors one horsepower and larger shall be provided with a copper frame grounding lug of hydraulic compression design, for installation by the electrical subcontractor.

2.07 STARTING EQUIPMENT

- A. Each motor shall be provided with proper starting equipment. Starting equipment shall be furnished by this Division.
- B. Relays and equipment supplied by this Contractor shall be integral with electrical equipment supplied.

2.08 RATING

- A. Speed and Size: Speed and approximate horsepower ratings are specified in equipment Specification Sections or are indicated on the Drawings. Furnish motors sufficiently sized for the particular application and with full-load rating not less than required by the driven equipment at specified capacity. Size motors so as not to overload at any point throughout the normal operating range.
- B. Voltage:
 - 1. Single phase: 115 volts for 120-volt nominal system voltage.
 - 2. Three phase: 200 volts for 208-volt nominal system voltage.
 - 3. Three phase: 230 volts for 240-volt nominal system voltage.
 - 4. Three phase: 230/460 volts for 240/480-volt nominal system voltage.
 - 5. Three phase: 460 volts for 480-volt nominal system voltage.
- C. Frequency: 60 Hertz.
- D. Efficiency: Provide energy-efficient motors meeting the requirements of NEMA MG1-12.55A, Table 12Y and MG 1.41.3. Efficiency to be determined by testing in accordance with NEMA MG 112.53 using IEEE 112A – Method B.
- E. Service Factor: According to NEMA MG 1-12.47 but not less than those indicated per the Table below.
- F. Table: NEMA Open Motor Service Factors:

<u>Horsepower</u>	<u>3600 RPM</u>	<u>1800 RPM</u>	<u>1200 RPM</u>	<u>900 RPM</u>
1/6 – 1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15
1.5-150 and above 150	1.15	1.15	1.15	1.15

PART 3 - EXECUTION

3.01 APPLICATION

- A. Single-phase motors for shaft mounted fans shall be split phase type.
- B. Single-phase motors for shaft mounted fans or blowers shall be permanent split capacitor type.
- C. Single-phase motors for fans shall be capacitor start, capacitor run type.
- D. Motors located in exterior locations and in direct drive axial fans, roll filters, humidifiers and draw-through air units shall be totally enclosed weatherproof epoxy-sealed type.

3.02 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Properly install and align motors after installation on the driven equipment.
- D. Motor feeders shall be free of splices. In special cases when splice-free feeders are impractical, splices may be allowed given prior written approval from the Owner.
- E. Use crimp-on, solderless copper terminals on the branch circuit conductors. For motors 20 horsepower and larger, use 5300 Series 3M motor lead splicing kit or approved equal.
- F. When the motor and equipment are installed, the motor's nameplate must be in full view.

3.03 TESTING

- A. General: Provide all necessary instruments, labor and personnel required to perform motor inspection and testing.
- B. Inspection: Inspect all motors for damage, moisture absorption, alignment, freedom of rotation, proper lubrication, oil leaks, phase and rotation and cleanliness, and report any abnormalities to Owner before energizing.
- C. Tests: Motor full load current and full load voltage shall be measured. Motor phase loss and phase unbalance protection shall be tested. Motor Test Report forms included at the end of this Section shall be completed and submitted prior to Substantial Completion.
- D. Energizing: After installation has been thoroughly checked and found to be in proper condition, with thermal overloads in motor controllers properly sized and all controls in place, energize the equipment at system voltage for operational testing.
- E. Motor Test Report Form:

DATE _____

SHEET ___ OF _____

PROJECT NAME _____

PROJECT NO. _____

MOTOR DESIGNATION _____, LOCATION _____

HP _____, FLA _____, LOCATION _____

PHASE LOSS AND PHASE UNBALANCE PROTECTION _____
INSULATION CLASS _____

SERVED FROM PANEL/MCC _____

MEASURED CONDITIONS

TEMPERATURE: _____ degrees F

RELATIVE HUMIDITY: _____ %

CURRENT (AMPS): ØA _____, ØB _____, ØC _____

VOLTAGE (VOLTS): ØB _____, ØBC _____, ØCA _____

ØAN _____, ØBN _____, ØCN _____

END OF SECTION 20 05 13

SECTION 20 05 29 – SUPPORTS AND SLEEVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Perform all Work required to provide and install supports, hangers, anchors, sleeves and bases for all pipe, duct, equipment, system components and accessories, indicated by the Contract Documents with all supplementary items necessary for complete, code compliant and approved installation

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. International Mechanical Code.
 - 2. Uniform Plumbing Code.
 - 3. Uniform Mechanical Code.
 - 4. International Plumbing Code.
 - 5. International Fuel Gas Code.
 - 6. ASME B31.2 - Fuel Gas Piping.
 - 7. ASME B31.9 - Building Services Piping.
 - 8. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
 - 9. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 10. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
 - 11. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
 - 12. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports.

13. NFPA 13 - Installation of Sprinkler Systems.
14. NFPA 14 - Installation of Standpipe and Hose Systems.
15. NFPA 99 - Standard for Health Care Facilities.
16. UL 203 - Pipe Hanger Equipment for Fire Protection Service.
17. SMACNA - HVAC Duct Construction Standards.
18. Underwriters Laboratories Standards and Listings.

1.04 QUALITY ASSURANCE

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS-SP-58 and SP-69 unless noted otherwise.
- B. Support and sleeve materials and installation shall not interfere with the proper functioning of equipment.
- C. Contractor shall be responsible for structural integrity of all hangers, supports, anchors, guides, inserts and sleeves. All structural hanging materials shall have a minimum safety factor of five.
- D. Installer Qualifications: Utilize an installer experienced in performing Work of this Section who is experienced in installation of Work similar to that required for this Project and per the minimum requirements of MSS SP-89. Field welding of supports shall be by certified welders qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX using welding procedures per the minimum requirements of MSS SP-58.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog data including code compliance, load capacity, and intended application.
- B. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.
- C. Shop Drawings: Submit detailed Drawings of all shop or field fabricated supports, anchors and sleeves, signed and sealed by a qualified State of Texas registered professional engineer. Indicate size and characteristics of components and fabrication details and all loads exceeding 250 pounds imposed on the base building structure.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Maintain in place until installation.
- C. Store materials protected from exposure to harmful weather conditions.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

- A. Hangers and Supports:
 - 1. Anvil International.
 - 2. Kinder.
 - 3. Cooper B-Line.
 - 4. C & S Mfg. Corp.
 - 5. Hubbard Enterprises/Holdrite
 - 6. National Pipe Hanger Corporation.
 - 7. Power Strut.

2.03 HANGERS AND SUPPORTS

- A. General:
 - 1. Refer to individual system and equipment Specification Sections for additional support requirements. Comply with MSS SP-69 for support selections and applications that are not addressed within these Specifications.
 - 2. Utilize hangers and supports to support systems under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses from being introduced into the structure, piping or connected equipment.
 - 3. All pipe supports shall be of the type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
 - 4. Design hangers to impede disengagement by movement of supported pipe.
 - 5. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.
 - 6. Wire or perforated strap iron will not be acceptable as hanger material.
 - 7. Hanger rods shall be threaded on both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.
 - 8. Fasteners requiring explosive powder (shooting) or pneumatic-driven actuation will not be acceptable under any circumstances.

9. Nail drive anchors, plastic anchors or plastic expansion shields will not be permitted under any circumstances.
 10. Hangers and clamps supporting and contacting individual non-insulated brass or copper lines shall be copper or copper plated. Support individual non-insulated brass or copper lines 4 inches and smaller with adjustable swivel ring hangers. Where non-insulated brass or copper lines are supported on trapeze hangers or channels, the pipes shall be isolated from these supports with approved flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp. Plastic tape is not acceptable.
 11. Hangers and clamps supporting and contacting glass piping shall be in accordance with the piping manufacturer's published recommendations and shall be fully lined with minimum 1/4 inch neoprene padding. The padding material and the configuration of its installation shall be submitted for approval.
 12. Hangers and clamps supporting and contacting plastic piping shall be in accordance with the piping manufacturer's published recommendations and shall be factory coated or padded to prevent damage to piping.
 13. Field fabricated supports shall be constructed from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- B. Finishes: All ferrous hangers, rods, inserts, clamps, stanchions, and brackets on piping within interior non-corrosive environments, shall be dipped in Zinc Chromate Primer before installation. Rods may be galvanized or cadmium plated after threading, in lieu of dipping zinc chromate. All hangers and supports exposed to the weather, including roofs and building crawl space areas, shall be galvanized or manufactured from materials that will not rust or corrode due to moisture. All hangers and supports located within corrosive environments shall be constructed from or coated with materials manufactured for installation within the particular environment.
- C. Vertical Piping:
1. Supports for vertical riser piping in concealed areas shall utilize double bolt riser clamps, with each end having equal bearing on the building structure at each floor level.
 2. Supports for vertical riser piping at floor levels in exposed areas (such as fire protection standpipe in stairwells) shall be attached to the underside of the penetrated structure utilizing drilled anchors, two hanger rods (sized as specified), and socket clamp with washers.
 3. Two-hole rigid pipe clamps or four-hole socket clamps with washers may be used to support pipe directly from adequate structural members where floor-to-floor distance exceeds required vertical support spacing and lines are not subject to expansion and contraction.
- D. Trapezes: Where multiple lines are run horizontally at the same elevation and grade, they may be supported on manufactured channel, suspended on rods or pipes. Trapeze members including suspension rods shall be properly sized for the quantity, diameters, and loaded weight of the lines they are to support.

- E. Ductwork: All ductwork shall be supported in accordance with SMACNA recommendations for the service involved. Horizontal ducts supported using galvanized steel bands shall extend up both sides and onto the construction above, where they shall turn over and be secured with bolts and nuts fitted in inserts set in the concrete, bolted to angles secured to the construction above, or secured in another approved manner.
- F. Terminal Units:
1. Terminal units weighing up to 150 pounds shall be supported by four (4) 1 inch wide sheet metal straps with ends turned under bottom of unit at corners.
 2. Each band shall be secured by not over 3/4 inch in length, 1/4 inch diameter sheet metal screws – two (2) on bottom of unit and one (1) on each side.
 3. The other strap end shall be attached to the structure by 1/4 inch diameter threaded bolt into the concrete insert or into drilled-hole threaded concrete expansion anchor.
 4. Where interference occurs, overhead of the box, not allowing direct vertical support by straps, provide trapeze channels suspended by 1/4 inch diameter galvanized threaded rods providing such channels do not block access panels of units.
 5. Terminal units weighing more than 150 pounds shall be supported per the terminal unit manufacturer's installation instructions using threaded rod and hanger brackets located per manufacturer's drawing.
- G. Fixture and Equipment Service Piping:
1. Piping at local connections to plumbing fixtures and equipment shall be supported to prevent the weight of the piping from being transmitted to fixtures and equipment.
 2. Makeshift, field-devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These shall be Hubbard Enterprises/Holdrite support systems, C & S Mfg. Corp. or Owner-approved equivalent.
 3. Supports within chases and partitions shall be corrosion resistant metal plate, clamps, angles or channels, and aligned with structure in the vertical or horizontal position. Plastic supports are not allowed unless approved by Owner.
 4. Horizontal supports within chases and partitions that are attached to studs shall be attached at both ends. Drywall shall not be relied upon to support the piping.
 5. Supports for plumbing fixture water service piping within chases and partitions may be attached to cast iron drain and vent pipe with approved brackets and pipe clamps.
 6. Piping exposed on the face of drywall shall be supported with corrosion resistant metal channels that are attached to wall studs. Drywall shall not be relied upon to support the piping.
 7. Piping supported from the floor shall utilize corrosion resistant metal channels or brackets that are anchored to the floor slab.
 8. All water piping shall be isolated from building components to prevent the transmission of sound.

9. All copper or brass lines shall be isolated from ferrous metals with dielectric materials to prevent electrolytic action. Plastic tape is not an acceptable isolation material.
- H. Fire Protection Piping: All hangers and supports for fire standpipe systems and fire sprinkler systems shall be Factory Mutual and Underwriters' Laboratories, Inc. listed and labeled.
- I. Inserts:
1. Cast-in-place concrete inserts shall comply with MSS-SP-69, U.L. and F.M. approved, and sized to suit threaded hanger rods.
 2. Inserts shall have malleable iron case with galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction. If the inserts are later found not to be in the proper location for the placement of hangers, then drilled anchors shall be installed. Drilled anchors in concrete or masonry shall be submitted for the approval.
 3. Manufactured inserts for metal deck construction shall have legs custom fit to rest in form valleys.
 4. Shop fabricated inserts shall be submitted and approved by Owner prior to installation.
 5. Inserts shall be of a type that will not interfere with structural reinforcing and that will not displace excessive amounts of structural concrete.
- J. Pipe Shields: Provide pipe shields in accordance with insulation manufacturer's published recommendations. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier.
- K. Housekeeping Pads:
1. Provide minimum 4 inch reinforced concrete pads with chamfered corners and equipment bases for all outdoor equipment on grade, floor mounted equipment in main central plant area, mechanical rooms, areas with floors below grade, penthouse equipment rooms, floor mounted air handling units, and where shown on Drawings.
 2. Housekeeping pads shall extend minimum of 4 inch on all sides beyond the limits of the mounted equipment unless otherwise noted.
 3. Provide galvanized anchor bolts for all equipment placed on concrete pads or on concrete slabs of the size and number recommended by the equipment manufacturer.

2.04 PIPE AND DUCT PENETRATIONS

A. General:

1. Seal penetrations through all rated partitions, walls and floors with U.L. tested assemblies to provide and maintain a rating equal to or greater than the partition, wall or floor.

2. Inside diameter of all sleeves or cored holes shall provide sufficient annular space between outside diameter of pipe, duct or insulation to allow proper installation of required fire and water proofing materials and allow for movement due to expansion and contraction.
3. Exposed ceiling, floor and wall pipe penetrations within finished areas (including exterior wall faces) shall be provided with chrome plated, brass or stamped steel, hinged, split-ring escutcheon with set screw or snap-on type. Inside diameter shall closely fit pipe outside diameter or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings. In exterior, damp, or corrosive environments, use Type 302 stainless steel escutcheons.

B. Floor Pipe Penetrations:

1. Seal penetrations through all floors to provide and maintain a watertight installation.
2. Sleeves cast in the slab for pipe penetrations shall be Schedule 40 steel, ASTM A53, with 2 inch wide annular fin water-stop continuously welded at midpoint of slab. Entire assembly shall be hot-dipped galvanized after fabrication. Water-stop shall be same thickness as sleeve.
3. Cored holes in the slab for pipe penetrations shall be provided with a Schedule 40 steel, ASTM A53 sleeve, with 2 inch wide annular fin water-stop continuously welded at point on sleeve to allow countersinking into slab and waterproofing. Entire sleeve assembly shall be hot-dipped galvanized after fabrication. Water-stop shall be same thickness as sleeve.
4. All sleeves shall extend a minimum of two inches above finished floor.
5. Where job conditions prevent the use of a sleeve that extends two inches above the slab, Link-Seal mechanical casing seals manufactured by Thunderline Corporation may be installed to provide a watertight penetration. Mechanical casing seals can be used only for relatively small diameter pipe penetrations. Verify that slab thickness allows proper installation of the link-seal assembly and the required fire stopping prior to applying this exception.

C. Wall Penetrations:

1. Where piping or ductwork passes through non-rated partition, close off space between pipe or duct and construction with gypsum wallboard and repair plaster smoothed and finished to match adjacent wall area.
2. Pipe penetrations through interior rated partitions shall be provided with adjustable prefabricated U.L. listed fire rated galvanized sheet metal sleeves having gauge thickness as required by wall fire rating, 20 gauge minimum. EXCEPTION: When U.L. Listed assembly does not require a sleeve,
3. Pipe penetrations through exterior walls and walls below grade shall be provided with "Link-Seal" mechanical casing seal manufactured by Thunderline Corporation.
4. Ductwork penetrations through rated partitions, walls and floors shall be provided with sleeves that are manufactured integral with the damper assembly installed.

D. Flashing:

1. Coordinate flashing material and installation required for pipe and duct roof penetrations with Owner and roofing Contractor.
 2. Provide flexible flashing and metal counter-flashing where ductwork penetrates exterior walls. Seal penetration water and air tight.
 3. Provide acoustical flashing around ducts and pipes penetrating equipment rooms, with materials and installation in accordance with manufacturer's instructions for sound control.
- E. Roof Curbs: Coordinate roof curb material and installation with Owner and roofing Contractor.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Conduct a pre-installation meeting prior to commencing Work of this Section to verify Project requirements, coordinate with other trades, establish condition and completeness of substrate, review manufacturer's installation instructions and manufacturer's warranty requirements.

3.02 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. Application, sizing and installation of piping, supports, anchors and sleeves shall be in accordance with manufacturer's printed installation instructions.
- C. Provide for vertical adjustments after erection and during commissioning, where feasible, to ensure pipe is at design elevation and slope.
- D. Install hangers and supports to allow controlled thermal movement of piping systems, permitting freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install hanger so that rod is vertical under operating conditions.
- F. Supports, hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system.
- G. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete that holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required. Contractor shall be responsible for engaging a structural engineer as required for design and review at support systems.
- H. Do not hang pipe, duct or any mechanical/plumbing item directly from a metal deck or locate on the bottom chord of any truss or joist unless approved by the Structural Engineer of Record.

- I. All supports shall be designed and installed to avoid interference with other piping, hangers, ducts, electrical conduit, supports, building structures, equipment, etc.
- J. Piping supports shall be independent from ductwork supports. Combining supports is not permitted.
- K. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the Drawings.
- L. All piping and ductwork supports shall be designed and installed to allow the insulation to be continuous through the hangers.
- M. Adjustable clevis hangers shall be supported at rods with a nut above and below the hanger.
- N. All hanger rods shall be trimmed neatly so that 1 inch of excess hanger rod protrudes beyond the hanger nut. In the event a rod is intentionally but temporarily left excessively long (for sloped or insulated lines for example), the Contractor shall take appropriate measures to protect the pipe or other materials from damage.
- O. Install hangers to provide minimum $\frac{1}{2}$ inch space between finished covering and adjacent structures, materials, etc.
- P. Horizontal and vertical piping in chases and partitions shall be supported to prevent movement and isolated from the supports to prevent transmission of sound.
- Q. Locate hangers within 12 inches of each horizontal elbow.
- R. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- S. Support riser piping independently of connected horizontal piping. Riser piping is defined as vertical piping extending through more than one floor level.
- T. Support riser piping at each floor level and provide additional supports where floor-to-floor distance exceeds required vertical support spacing. Installation of riser clamps and welded steel riser supports shall not allow weight of piping to be transmitted to floor sleeves.
- U. Steel Bar Joists: Hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded or otherwise permanently fixed to the top of joists.
- V. Steel Beams: Where pipes and loads are supported under steel beams, approved type beam clamps shall be used.

- W. Pre-Cast Tee Structural Concrete: Hanger supports, anchors, etc. attached to the precast, double tee, structural concrete system shall be installed in accordance with approved Shop Drawings only. Holes required for hanger rods shall be core drilled in the "flange" of the double tee only; impact type tools are not allowed under any circumstances. Core drilling in the "stem" portions of the double tee is not allowed. Holes core drilled through the "flange" for hanger rods shall be no greater than 1/4 inch larger than the diameter of the hanger rod. Hanger rods shall supported by means of bearing plates of size and shape acceptable to the Architect/Engineer, with welded double nuts on the hanger rod above the bearing plate. Cinch anchors, lead shields, expansion bolts, and studs driven by explosion charges are not allowed under any circumstances in the lower 15 inches of each stem and in the "shadow" of the stem on the top side of the "double tees".
- X. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Y. Inserts:
1. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 2. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 3. Install anchors in concrete after concrete is placed and completely cured. Install anchors according to manufacturer's written instructions..
- Z. Flashing:
1. Coordinate all roof flashing with requirements of Division 07.
- AA. Pipe Shields:
1. Provide shields at each hanger supporting insulated pipe.
 2. Provide shields of the proper length to distribute weight evenly and to prevent compression of insulation at hanger.
 3. Install shield so that hanger is located at the center of the shield.
 4. Attach shield to insulation with adhesive to prevent slippage or movement.
- BB. Equipment Anchor Bolts:
1. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Each bolt shall be set in a sleeve of sufficient size to provide 1/2 inch clearance around bolt.

END OF SECTION 20 05 29

SECTION 20 05 53 – PIPING AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Perform all Work required to provide and install Owner's equipment tags, fire damper tags, valve tags, stencils, and pipe markers indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Contractor shall make it possible for Owner's operations and maintenance personnel to readily identify the various pieces of equipment, valves, piping, ductwork, fire dampers etc., by marking them in accordance with this Specification.
- C. Clearly mark all items of equipment, including but not limited to, fans, pumps, fire dampers, and valves using equipment tags as specified in this Section. The tagged item of equipment shall correspond to the same number as shown on the Drawings and as listed in the Equipment Matrix. Download an electronic version of the Equipment Matrix in Microsoft Excel format to use as a template for submittal purposes at the following website:
- D. Refer to Specification Section 01 91 00, General Commissioning Requirements, for a detailed description of Equipment Matrix information.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.
 - 2. NFPA 99 – Standard for Health Care Facilities.
 - 3. NFPA 13 – Installation of Sprinkler Systems.
 - 4. NFPA 14 – Installation of standpipe and Hose Systems.
 - 5. International Plumbing Code.

1.04 SUBMITTALS

A. Product Data:

1. Provide manufacturer's catalog literature for each product.

B. Record Documents:

1. Submit Equipment Matrix with Valve and Fire Damper schedules completed..xlsx

C. Operation and Maintenance Data:

1. Manufacturer's Installation Instructions: Indicate special procedures and installation.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Equipment Tags, Valve Tags, and Markers:

1. Marking Systems, Inc.
2. Seton Name Plate Company.
3. W.H. Brady Company.
4. Graphic Products, Inc.

2.03 EQUIPMENT AND FIRE DAMPER TAGS

- A. Description: 3" x 4" vinyl label, 3.0 Mil self-adhesive vinyl similar to DuraLabel Pro. Label color shall be black text on a white background. The label shall contain the following information per the template, described in Attachment "B":

1. Asset Short Description As listed in Equipment Matrix.
2. Asset Number: As listed in Equipment Matrix.
3. Asset Location: As listed in Equipment Matrix.
4. Asset Bar Code Number.

- B. All scheduled equipment shall be identified with an Equipment Tag.

2.04 VALVE TAGS

- A. Valve tags shall conform to ANSI A13.1-1981 "Scheme for the Identification of Piping Systems", refer to Attachment "A" for abbreviation, and label color designations.

- B. Valve tags shall be black ABS plastic tags: Injected molded ABS plastic, 3.375" X 4.75" with self-adhesive vinyl label, similar to DuraLabel Pro, affixed to valve tag. Each tag shall be attached to its valve with one tie strap.
- C. Vinyl Label: 3.0 Mil self-adhesive vinyl similar to DuraLabel Pro. Label color shall be as per the standard designated colors listed in the attachment to this specification. The label shall contain the following information as per template, refer to Attachment "B":
 - 1. Asset Short Description: As listed in Equipment Matrix.
 - 2. Asset Number: As listed in Equipment Matrix.
 - 3. Asset Location: As listed in Equipment Matrix. .
 - 4. Asset Bar Code Number.
- D. Each valve shall be named as per attached valve tag naming convention, refer to Attachment "C".
- E. In addition to valve tags, valves at water headers and steam PRV stations, valves associated with condensate, gas, water meters, and other valves as specified shall be tagged with standardized color coded plastic tags. Each tag shall be attached to its valve with one tie strap. These tags shall be 2-½ inches wide by 1-½ inches high with these color codings:
 - 1. Red = normally closed.
 - 2. Green = normally open.
 - 3. Blue = open in winter, closed in summer.
 - 4. Yellow = closed in winter, open in summer.
- F. Valve Tag Fasteners: Single ABS plastic tie strap.

2.05 PIPE AND DUCT MARKERS

- A. Round Pipe and Duct Markers shall conform to ANSI A13.1-2007 "Scheme for the Identification of Piping Systems", refer to Attachment "A" for abbreviation and label color designations. Arrow markers must have same ANSI background colors as their companion pipe markers, or be incorporated into the pipe identification marker.
- B. Rectangular Duct Stencils shall conform to ANSI A13.1-2007 "Scheme for the Identification of Piping Systems", refer to Attachment "B" for abbreviation and label color designations. Letter height shall be a minimum of 1-1/4". Stencil material shall be fiber board; Stencil paint shall be exterior, gloss, acrylic enamel. The following rectangular duct systems shall be stenciled:
 - 1. Chemical Fume Hood Exhaust.
 - 2. Biosafety Cabinet Exhaust.
 - 3. Radioisotope Exhaust.
 - 4. ETO Exhaust.

- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Heat sealed or heat shrink, spring fasteners, clips or snap-on are acceptable.
- E. Underground Plastic Pipe markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- F. All medical gas piping shall have minimum information per NFPA 99, plus operating pressure.
- G. Pipe markers and arrow markers also shall be provided for all piping systems.
- H. Use Seton Setmark Type SNA or Brady snap-on type identification for all piping systems, up through 6 inch. For piping systems larger than 6 inches, use Seton or Brady strap-on markers or similar by Marking Services, Inc.

2.06 CEILING GRID TAG FOR EQUIPMENT LOCATED ABOVE LAY-IN CEILING

- A. Description: 3/4" x variable length" vinyl label, 3.0 Mil self-adhesive vinyl similar to Dura Label Pro. Label color shall be black text on a white background. The label shall contain the following information per the template, described in Attachment "C":
 - 1. Asset Short Description:As listed in Equipment Matrix.
 - 2. Asset Bar Code Number.
- B. All scheduled equipment above finish lay-in ceiling shall be identified with an Equipment Tag.
- C. All ceiling grid tags shall be installed prior to the ceiling cover inspection.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Install plastic tape, and pipe markers completely around pipe in accordance with manufacturer's instructions.
- D. Locate markers on the two (2) lower quarters of the pipe where view is unobstructed.

3.02 VALVE TAGS

- A. Contractor(s) shall provide and install valve tags on all valves installed within this Project, except check valves; valves within fabricated equipment units; faucets; hose connections; needle valves; gauge cocks; HVAC terminal devices and similar roughing-in connections of end-use fixtures and units.

- B. Existing valve tags shall not be attached to new valves. When removing and/or replacing existing tagged valves, give the Owner all existing tags that are attached to the valves that are removed. New tags with new asset numbers shall be provided for new valves.

3.03 APPLICATION OF MARKERS AND STENCILS

- A. Piping runs throughout the Project including those above lift-out ceilings, under floor and those exposed to view when access doors or access panels are opened shall be identified by means of pipe markers and/or stencils. Concealed areas, for purposes of this identification section, are those areas that cannot be seen except by demolition of the building elements. In addition to pipe markers and/or stencils, arrow markers shall be used to indicate direction of flow.
- B. As a minimum, locate pipe markers and/or stencils as follows:
 - 1. Provide a pipe marker at each valve to indicate proper identification of pipe contents. Where several valves exist on one (1) header, it is necessary to mark only the header.
 - 2. Every 20 feet in exposed and concealed areas on all piping systems. Provide at least one (1) pipe marker in each room on all piping systems.
 - 3. At each branch or riser take off on piping systems, excluding short takeoffs for fixtures and terminal units.
 - 4. Provide a pipe marker or stencil and an arrow marker at every point of pipe entry or exit where the pipe penetrates a wall, floor, service column or enclosure.
 - 5. At access doors, manholes and similar access points that permit view of concealed piping.
 - 6. Near major equipment items and other points of origination and termination.
- C. Provide an arrow marker with each pipe marker pointing away from the pipe marker to indicate direction of flow.
- D. Provide a double-ended arrow marker when flow can be in either or both directions.
- E. Indicate delivered water temperature on domestic hot water supply and return lines.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Tag automatic controls, instruments and relays. Key to control schematic.
- J. Provide ceiling grid tags to locate valves, fan coil units, dampers or other concealed equipment above T-bar type panel ceilings. Locate in corner of grid closest to equipment.
- K. Identify pipe utilizing copper press fittings with markers stating, "Press-Fit" adjacent to each content identification marker.

- L. Identify medium pressure gas piping (14 inches water column to 5psi) with the statement, "WARNING – ½ to 5psi NATURAL GAS".
- M. Identify right and left nipple and coupling union assemblies with the statement "Right/Left Nipple/Coupling".

ATTACHMENTS:

- "A" - Label Abbreviations, Background and Text colors**
- "B" – Label examples with dimensions, font type and height**
- "C" – Valve tag naming convention**

END OF SECTION 20 05 53

ATTACHMENT “A”

Mechanical/Fire Suppression/Plumbing Piping System Abbreviations and Letter/Label Coloring


Pipe Contents	Label Abbreviation	Label Colors (Background/Text)
Acid Waste	ACID	Orange/Black
Argon	AR	Green/White
Biosafety Cabinet Exhaust	BCE	Purple/white
Brine Water	BR	Orange/Black
Carbon Dioxide	CO ₂	Gray/white
Chemical Fume Hood Exhaust	CFHE	Purple/white
Chilled Water Return	CHWR	Green/White
Chilled Water Supply	CHWS	Green/White
Condensate Drain	CD	Green/White
Condenser Water Return	CWR	Green/White
Condenser Water Supply	CWS	Green/White
Deionized Water Supply	DIS	Green/White
Deionized Water Return	DIR	Green/White
ETO Exhaust	ETOE	Purple/white
Fire Suppression Water	FIRE	Red/White
Fuel Oil Return	FOR	Yellow/Black
Fuel Oil Supply	FOS	Yellow/Black
Gray Water	Gray Water	Gray/White
Grease Waste (Kitchen)	GW	Black/White
Hazardous Waste	HAZ	Orange/Black
Helium	He	Brown/white
High Pressure Condensate	HPC	Blue/White
High Pressure Steam (above 125#)	HPS	Blue/White
Hot Water Heating Return	HWR	Green/White
Hot Water Heating Supply	HWS	Green/White
Instrument Air	IA	Red/white
Laboratory Compressed Air	Lab Air	Yellow and white checkerboard/black
Laboratory Vacuum	Lab Vac	White and black checkerboard/black boxed
Laboratory Waste	Lab Waste	Orange/Black
Laboratory Vent	Lab Vent	Orange/Black
Low Pressure Condensate	LPC	Blue/White
Low Pressure Steam (below 25#)	LPS	Blue/White
Medical Compressed Air	Med Air	Yellow/black
Medical–Surgical Vacuum	Med Vac	White/black
Medium Pressure Condensate	MPC	Blue/White
Medium Pressure Steam (above 25# - below 125#)	MPS	Blue/White
Natural Gas	NG	Yellow/Black
Nitrogen (gaseous)	N ₂	Black/white
Nitrogen (liquid)	LN2	Black/White
Nitrous Oxide	N ₂ O	Blue/white

ATTACHMENT “A”


Pipe Contents	Label Abbreviation	Label Colors (Background/Text)
Non-Potable Water	-	Green/White
Medical Oxygen	O ₂	Green/white
Potable Cold Water	DCW	Green/White
Potable Hot Water Return	DHWR	Green/White
Potable Hot Water Supply	DHW	Green/White
Pumped Condensate Return	PCR	Blue/White
Quench Vent	-	White/Fluorescent Orange
Radioisotope Exhaust	RE	Yellow/magenta
Refrigerant Liquid Line (Circuit #1, 2, 3, etc. as applicable)	Refrig Liq #	Green/White
Refrigerant Suction Line (Circuit #1, 2, 3, etc. as applicable)	Refrig Suct #	Green/White
Reverse Osmosis Water Supply	ROS	Green/White
Reverse Osmosis Water Return	ROR	Green/White
Sanitary Waste	SS	Green/White
Sanitary Vent	SV	Green/White
Storm Drain	SD	Green/White
Softened Water	SW	Green/White
Waste Anesthetic Gas Disposal	WAGD	Violet/white

ATTACHMENT “B”

Equipment Tag Layout

<u>Tag Information</u>	<u>3”h X 4”w Tag</u>	<u>Font Description /Height</u>
Standard Information	FACILITIES MANAGEMENT TAG	Arial 9
Asset Short Description (If required, text wrap)	Fan Coil Unit, FCU 13-4	Arial Bold (3 lines for text) 16
Asset Number	12260	Arial Bold 24
Asset Location	Asset Location: G15.3531	Arial 16
Asset Bar Code Number	 12260	BC C39 3 to 1Medium 3 lines for future text) 28
Standard Information	This is not an Institutional Tag	Arial 9

Example of Completed Equipment Tag

FACILITIES MANAGEMENT TAG
Fan Coil Unit, FCU 13-4
12260
Asset Location: G15.3531
 12260
This is not an Institutional Tag

ATTACHMENT “B”

Ceiling Grid Tag Layout for Equipment Located Above Finish Ceiling

Tag Information

Asset Bar Code #	Equipment Plan Designation
------------------	----------------------------

3/4”h x variable length TAG

 12260	Fan Coil Unit, FCU 13-4
--	-------------------------

Font & Height

BC C39 3 to 1 Medium	Arial 24
----------------------	----------

ATTACHMENT “C”

Valve Tag Naming Convention

- The first set of characters are system type designators. (Number of letters will vary per system type)

X	X	X	X	X	-	X	X	X	X	-	X	X	X
---	---	---	---	---	---	---	---	---	---	---	---	---	---



System Type Abbreviation (See Attachment “B” for abbreviations)

- A dash shall separate each set of characters.

X	X	X	X	X	-	X	X	X	X	-	X	X	X
---	---	---	---	---	---	---	---	---	---	---	---	---	---



Placeholder

- The middle set of characters are the building designator.

X	X	X	X	X	-	X	X	X	X	-	X	X	X
---	---	---	---	---	---	---	---	---	---	---	---	---	---



Building Designator (Contact Owner’s Project Manager for building number)

- A dash shall separate each set of characters.

X	X	X	X	X	-	X	X	X	X	-	X	X	X
---	---	---	---	---	---	---	---	---	---	---	---	---	---



Placeholder

- The last set of characters are sequential valve tag numbers.

X	X	X	X	X	-	X	X	X	X	-	X	X	X
---	---	---	---	---	---	---	---	---	---	---	---	---	---



Sequential Valve Tag Number

(Number of digits will vary based on quantity of valves installed)

Below is an Example for a Chilled Water Supply Valve Located in Anderson Central:

	C	H	W	S	-	1	0	0	B	-	9
--	---	---	---	---	---	---	---	---	---	---	---

NOTE: No two valve tags shall have the same name or asset number. Obtain valve tag names from Owner’s Property Manager when installing valves within existing systems.

SECTION 20 07 19 – PIPING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Perform all Work required to provide and install piping insulation, jackets and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.
 - 3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.
 - 4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.
 - 5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
 - 6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - 7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 - 9. ASTM C547 - Mineral Fiber Pipe Insulation.
 - 10. ASTM C552 - Cellular Glass Thermal Insulation.
 - 11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
14. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.
15. ASTM C921 - Jackets for Thermal Insulation.
16. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
17. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
18. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
19. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).
20. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
21. ASTM C795 - Insulation For Use Over Austenitic Steel.
22. ASTM E84 - Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Water Vapor Transmission of Materials.
24. NFPA 255 - Surface Burning Characteristics of Building Materials.
25. UL 723 - Surface Burning Characteristics of Building Materials.
26. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.04 DEFINITIONS

- A. Concealed: Areas that cannot be seen by the building occupants.
- B. Interior Exposed: Areas that are exposed to view by the building occupants, including equipment rooms.
- C. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.
- D. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

1.05 QUALITY ASSURANCE

- A. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

- B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.
 - 1. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications.
 - 2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.
- C. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years experience specializing in the trade.
- D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.
- E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.06 SUBMITTALS

- A. Product Data:
 - 1. Provide product description, list of materials, "k" value, "R" value, mean temperature range, and thickness for each service and location.
 - 2. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type
- B. Operation and Maintenance Data:
 - 1. Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.
- B. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.
- C. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Insulation:

1. Owens-Corning (Type P1).
2. Certainteed Corporation (Type P1).
3. Johns Manville Corporation (Type P1).
4. Knauf Corporation (Type P1).
5. Dow Chemical Company (Type P2).
6. Armstrong/Armacell (Armaflex) (Type P3).
7. RBX Industries/Rubatex (Type P3).
8. Industrial Insulation Group, LLC (Type P4).
9. Resolco International by (Insul-Phen) (Type P5).
10. KingSpan Tarec (Kooltherm 37-60) (Type P5C and P5D).
11. FOAMGLAS (Cellular Glass) by Pittsburgh Corning (Type P6).

B. Jackets:

1. Childers Products Company
2. PABCO
3. RPR Products, Inc.
4. Venture Clad Corporation
5. Foster Vapor Fas 62-05
6. Foamglas

C. Coatings, Sealants, and Adhesives:

1. Foster
2. Childers

2.03 INSULATION

- A. Type P1: Fiberglass preformed insulation; ASTM C 547; minimum 3.0 lb/cu ft density, ASTM C335, 'k' value of 0.23 at 75 degrees F; noncombustible.
- B. Type P2: Molded closed cell polyisocyanurate insulation; ASTM E96, maximum water vapor transmission rating of 0.005 Perm-In; ASTM C518, 'k' value of 0.20 at 75 degrees F; ASTM D2842, water absorption value of 0.05 lb/ft².
- C. Type P3: Closed cell elastomeric, flexible, insulation; ASTM E96; maximum vapor transmission rating of 0.20 perms; ASTM C 518; 'k' value of 0.27 at 75 degrees F.
- D. Type P4: Mineral Wool; ASTM C 547; preformed, high temperature insulation; 'k' value of 0.35 at 300 degrees F.
- E. Type P5: Phenolic closed cell, ASTM C1126 rigid foam, 2.2 lbs. nominal density, CFC free; ASTM C518, 'k' value of 0.13 at 75 degrees F. (Note material thickness limit is 3 inches as tested in accordance with ASTM E84).
- F. Type P5A: Phenolic closed cell insulation; ASTM E96, maximum water vapor transmission rating of 0.02 Perm-In; ASTM C1126 rigid foam, 3.75 lbs. nominal density, CFC free; ASTM C518, 'k' value of 0.16 at 75 degrees F. (Note material thickness limit is 3 inches as tested in accordance with ASTM E84).
- G. Type P5B: Phenolic closed cell insulation; ASTM E96, maximum water vapor transmission rating of 0.02 Perm-In; ASTM C1126 rigid foam, 5.0 lbs. nominal density, CFC free; ASTM C518, 'k' value of 0.21 at 75 degrees F. (Note material thickness limit is 3 inches as tested in accordance with ASTM E84).
- H. Type P5C: Phenolic closed cell insulation; ASTM E96, maximum water vapor transmission rating of 0.01 Perm-In; ASTM C1126 rigid foam, 2.3 lbs/cu.ft. nominal density, CFC free; ASTM C518, 'k' value of .146 Btu·in/hr·ft²·°F at 77 degrees F.
- I. Type P5D: Phenolic closed cell insulation; ASTM E96, maximum water vapor transmission rating of 0.01 Perm-In; ASTM C1126 rigid foam, 3.75 lbs/cu.ft. nominal density, CFC free; ASTM C518, 'k' value of .20 Btu·in/hr·ft²·°F at 77 degrees F
- J. Type P6: Cellular Glass, ASTM C552, 7.5 lbs./cu.ft, density, ASTM E96 (Wet Cup Method) 0.00 water vapor perm , ASTM C518 'k' value of 0.29 at 75 degrees F.

2.04 JACKETS

- A. Factory Applied Jackets:
 - 1. White kraft bonded to reinforced foil vapor barrier with self-sealing adhesive joints.
 - 2. ASJ White, triple-ply laminate polypropylene, mold resistant, metalized polyester vapor barrier film backing: Venture 1555U or Insulrap 30 Vapor Barrier I-30.
- B. Field Applied Jackets:

1. PVC Jackets: UL listed 25/50 rated per ASTM E 84, UV resistant, minimum insulation thickness 0.020 inches for pipe outside diameters up to 18 inches and 0.030 inches for pipe outside diameters 18 inches and above. Standard manufactured PVC cover fittings cover system consisting of one-piece, pre-molded, PVC covers with fiberglass inserts manufactured from 20-mils thick, high-impact, ultraviolet-resistant. Use ultraviolet resistant adhesive as recommended by the manufacturer.
2. Reinforcing Mesh: Glass Fiber Childers Chil-Glas #10 or synthetic 9X8 mesh with minimum weight of 0.9 ounces per square yard.
3. Aluminum Jackets: ASTM B 209; 0.020 inch thick; smooth finish with factory applied moisture barrier.
4. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; smooth finish.
5. VentureClad 1577CW or Foster Vapor Fas 62-05, zero permeability and mold resistant jacket material, 5-ply laminate with 5-6 mil film with adhesive on one side. Jacketing laminated film must have UV coating for additional exterior protection. Product shall be used with phenolic closed cell insulation where Type 5A and 5B insulation is installed on existing chilled water piping being repaired or being modified.

2.05 COATINGS, SEALANTS, AND ADHESIVES

- A. Insulating Cement: ASTM C 195; hydraulic setting mineral wool; Ryder One-Coat.
- B. Sealants: Foster 95-50; Childers CP-70 or CP-76
 1. Apply at valves, fittings and where insulation is terminated. Brush-apply sealant to end of insulation and continue along pipe surface.
 2. Below-ambient closed cell pipe insulation (Type P5, P5A, P5B): apply sealant on all longitudinal and butt insulation joints to prevent moisture transmission.
- C. Adhesives: Use to adhere the longitudinal lap seam of vapor barrier jackets and at butt joints between insulation or fitting covers. Provide Childers CP-82 or Foster 85-20/85-60 as general purpose adhesive. For use with calcium silicate or expanded perlite insulation, use Childers CP-97 or Foster 81-27 fibrous adhesive when adhering pipe saddles and shields to the insulation.
- D. Primers: For proper bonding with lagging adhesive/canvas provide light coat of Childers CP-50 AMV1 or Foster 30-36 diluted 50 percent with water over insulation or Pittcoat 300 primer thinned with mineral spirits to cover insulating cements prior to finish coating.
- E. Coatings and Mastics:
 1. Vapor barrier coating for indoor, below-ambient applications: Foster 30-80 or Childers CP-38 on all elbows, fittings, and valves. Coating shall adhere to MIL-C-19565C, Type II and shall be QPL listed.
 2. Weather barrier/breather mastics for above-ambient piping applications: Childers CP-10/CP-11 or Foster 46-50.
 3. High humidity applications: Foster 30-80 AF or Childers CP-137 AF fungus/mold resistant coating that meets ASTM D 5590 with zero growth rating.

4. Exterior applications: Childers CP 30LO (must be covered by metal jacketing), Childers CP-45 Encacel V, or Foster 60-95 Monolar for insulated elbows/fittings, longitudinal seams, and butt joints of vapor barrier jackets or glass cloth jackets.
5. Finish coat over closed cell elastomeric: Foster 30-64 or Armstrong "Finish" acrylic finish.
6. Canvas Finishes:
 - a. Apply lagging adhesive to prevent mildew for securing canvas. Apply anti-fungal lagging adhesive that adheres to ASTM D 5590 with zero growth rating. (Foster 30-36AF, Childers CP-137AF) Do not use wheat paste.
 - b. Exterior Applications: cover all canvas insulation with a fire-retardant weather barrier mastic. On canvas jacketed systems where seam joints at fittings are rough, cover with an application of insulating cement and smooth with a trowel before the canvas is applied with adhesive. Canvas shall be free of wrinkles and have a smooth, neat appearance.
- F. Reinforcing Mesh: Childers Chil-Glas #10 or Foster Mast-a-Fab 9x8 reinforcing mesh with coatings and mastics.
- G. Lagging Adhesives/Coatings: Childers CP-50A HV2 or Foster 30-36 for adhering canvas and glass cloths over thermal insulation installed indoors. Adhesive shall adhere to MIL-A-3316C Class I, Grade A.
 - a. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating that meets ASTM D 5590 with zero growth rating. Coating shall adhere to MIL-C-19565C, Type II and must be QPL listed.

2.06 APPLICATIONS

- A. Interior Concealed Applications (Plenums, Chases):
 1. Type P1 Insulation: Provide factory applied ASJ white kraft foil vapor barrier.
 - a. Below-ambient piping: Coat all ASJ seams with Foster 30-80 or Childers CP-38 vapor barrier coating. Coat all elbows, fittings, and valves with same vapor barrier coating and Foster Mast-a-Fab or Childers Chil-Glas #10 reinforcing mesh.
 - b. High humidity applications: Foster 30-36 AF.
 2. Type P3 Insulation: Finish coat is not required.
 3. Type P4 Insulation: Lightly coat insulation with lagging adhesive diluted 50% with water for proper bonding with canvas/lagging adhesive. Cover with a canvas jacket and non-diluted Childers CP-50A HV2 or Foster 30-36 lagging adhesive.
 - a. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating.
 4. Type P5 and P5A, 5B Insulation: VentureClad jacket on piping where condensation can occur or where installed on existing chilled water piping, chilled water condensate drain piping, and roof storm drain piping that transports cold rain water from the building roof.

5. Type P5 Jacket not required when insulation is used on hot water piping.
 6. Type P6 Insulation:
 - a. Above-ambient piping: Pittcoat 404, Foster 46-50, or Childers CP-10/11 pre-molded PVC covers per manufacturer's recommendations. Jacket is not required when this type of piping insulation is concealed within a piping chase.
 - b. Below-ambient piping: Coat all ASJ seams with Foster 30-80 or Childers CP-38 vapor barrier coating. Coat all elbows, fittings, and valves with same vapor barrier coating and Foster Mast-a-Fab or Childers Chil-Glas #10 reinforcing mesh.
 - c. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating.
- B. Interior Exposed Applications (Equipment Rooms):
1. Type P1 and P2 Insulation: Factory applied ASJ white kraft foil vapor barrier. Finish with canvas jacket or Childers Chil-Glas #10 glass membrane with Childers CP-50A HV2 or Foster 30-36. Verify jacket is suitable for applications.
 - a. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating. Finish coat is not required.
 2. Type P3 Insulation: Finish coat is not required.
 3. Type P4 Insulation: Lightly coat insulation with lagging adhesive diluted 50% with water for proper bonding with canvas/lagging adhesive. Cover with a canvas jacket and non-diluted Childers CP-50A HV2 or Foster 30-60 lagging adhesive.
 - a. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating. Finish coat is not required.
 4. Type P5 Insulation: Factory applied ASJ white kraft foil vapor barrier.
 5. Type P5 and P5A Insulation: VentureClad jacket on piping where condensation can occur or where installed on existing chilled water piping, chilled water condensate drain piping, and roof storm drain piping that transports cold rain water from the building roof.
 6. Type P6 Insulation: Provide triple-ply laminate polypropylene, mold resistant with a metal foil and polyester vapor barrier film backing.
 - a. Below-ambient piping: Coat all ASJ seams with Foster 30-80 or Childers CP-38 vapor barrier coating. Coat all elbows, fittings, and valves with same vapor barrier coating and Foster Mast-a-Fab or Childers Chil-Glas #10 reinforcing mesh.
 - b. Above-ambient piping: Provide Pittcoat 404, Foster 46-50, or Childers CP-10/11 or pre-molded PVC covers per manufacturer's recommendations.
 - c. High humidity applications (unconditioned space): Foster 30-36 AF or Childers CP-137 AF fungus/mold resistant coating.
 7. All exposed insulated piping within six (6) feet of the floor shall be protected with aluminum or stainless steel jacket to protect insulation from being torn or punctured.

C. Exterior Applications:

1. Insulate piping system as indicated under Interior Exposed Applications, prior to final jacket installation.
2. Provide electric heat tracing for all exterior small bore piping 2 inches and smaller where water may be susceptible to freezing due to intermittent flow conditions.
3. Final jacket cover shall be aluminum or stainless steel having integral moisture barrier with seams located at 2 or 10 o'clock position of horizontal piping. All laps shall be minimum 2 inches. Apply Foster 95-44 or Childers CP-76 metal jacketing sealant on all laps to prevent water transmission.
4. Type P1 Insulation: For above-ambient piping, finish with Childers Chil-Glas #10 or 9X8 reinforcing mesh and Childers CP-10/CP-11, or Foster 46-50 weather barrier/breather mastic, prior to final jacket installation.
5. P6 Insulation Above-ground: Provide (50 mil thickness) self-sealing non-metallic, bituminous compound reinforced with glass fiber membrane with 1 mil aluminum top film jacketing for both chilled water and hot water piping (PITWRAP CW Plus). Provide metal jacket where material is exposed to ultraviolet rays.
6. P6 Insulation Underground: Provide factory applied (50 mil thicknesses) self-sealing membrane bituminous compound reinforced with glass fiber for chilled water piping (PITWRAP IW 50 or Foster C.I. Wrap 50mil). Metal jacket not required for buried pipe.

2.07 INSERTS, SUPPORTS AND SHIELDS

- A. Application: Piping ½ inch diameter or larger for all systems except direct buried.
- B. Shields shall be made of galvanized steel or made of black iron painted on both sides with a minimum two coats of aluminum paint. Minimum metal shield sizes shall be as listed within the following table. Provide thicker/longer shields where recommended by insulation manufacturer's published product installation data:

Nominal IPS (inches)	Minimum Metal Thickness (gage)	Minimum Length (inches)
½ to 1 1/4	18	12
1 1/2 to 2	16	12
2 1/2 to 8	14	18
10	12	24

- C. Provide MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier.
- D. Inserts for shields shall be manufactured of 7.5 lb/cu. ft. density cellular glass or 5.0 lb/cu. ft. density cellular, phenolic insulating material suitable for the planned temperature range. Provide factory fabricated inserts with integral galvanized pipe saddles. Inserts shall be the same thickness as the adjacent insulation.
- E. Depending on the type of pipe support design, stainless steel bands or aluminum bands may be required to keep shield material next to the jacketing material.

1. Insulation Bands: 3/4 inch wide; 0.007 inch thick galvanized steel when exposed to interior environment, 0.010 inch thick stainless steel or 0.015 inch thick aluminum when exposed to humid interior environment or outside environment.
2. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel to match jacket.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that piping has been inspected at the welds and pressure tested before applying paint and insulation materials.
- B. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping shall be completely dry at the time of application of primer paint. Painting on piping where condensation is occurring on the pipe surface is strictly prohibited.
- C. Provide primer coat on all steel piping field welds. Painting shall be completed and approved prior to installation of insulation. Paint shall be applied in accordance with the paint manufacturer's instructions, environment, and pipe surface temperatures.

3.02 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. Installation of insulation and jacket materials shall be in accordance with manufacturer's published instructions.
- C. Handle and install materials in accordance with manufacturer's instructions in the absence of specific instructions herein.
- D. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.
- E. Exposed Insulated piping within six feet of the floor shall be protected with an aluminum or stainless jacket material to protect the insulation.
- F. Insulate fittings, joints and valves with molded insulation of the same material and thickness as adjoining pipe. Open voids and cracks insulation shall be kept at a minimum when placing insulation on abnormal or irregular shapes. Use closed cell or recommended fill material as instructed by the insulation manufacturer to close openings. Fiberglass insulation shall not be used as a fill material on chilled water piping or fittings. Vapor seal all cold piping ASJ seams and elbows/fittings with vapor barrier coating and reinforcing mesh.
- G. Continue insulation through walls, sleeves, pipe hangers, floors, and other pipe penetrations.
- H. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

- I. Where insulation is required, insulate entire system including fittings, valves, flanges and strainers. Use closed cell insulation on cold piping system flexible connections, expansion joints and unions, bevel and seal ends of insulation and continue sealant or coating a minimum of 4 inches along the piping, unless stated otherwise. On all closed-cell insulation, cold piping, use insulation joint sealant on all longitudinal and butt joints
- J. For hot piping conveying fluids 180 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation. Continue sealant or coating a minimum of 4 inches along the piping.
- K. On heating piping systems conveying fluids over 180 degrees F with unions, flanges, valves, strainers and equipment that are anticipated to be removed for maintenance, the insulation shall terminate (beveled to pipe) just prior to the flange or union with vapor barrier sealed to pipe. The tapered segment of insulation shall not interfere with the removal of unions flange bolts or equipment. The unions, flanges, valves and strainers shall be insulated with removable insulated covers with toggle catches or Velcro straps
- L. All sections of molded pipe covering shall be firmly butted together. Where an insulation covering is applied, it shall lap the adjoining section of insulation by at least three inches (3 inches). Where insulation terminates, it shall be neatly beveled and finished. All materials used shall be fire retardant or nonflammable.
- M. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall be sealed with vapor barrier coating. Where insulation with a vapor barrier terminates, seal off with vapor barrier continuous to the surface being insulated. Ends shall not be left raw.
- N. Where pipe chases are tight, adequate provision shall be made at the rough-in stage using offset fittings or other means (except springing the pipe) to ensure that insulation can be applied throughout the length of the pipe.
- O. When installing phenolic insulation provide a 5 lb. density insert of same thickness and contour as adjoining 3.75 lb. density insulation, between the support shield and piping, and under the finish jacket, on piping 1½ inch diameter or larger, to prevent insulation from sagging at support points. Provide inserts for 180-degree arc and not less than 2 inches more than the length of the pipe support shield or minimum 12 inches long (whichever is greater). Pipe support shield shall be adhered to insulation with a UL approved adhesive that meets E-84 requirements.
- P. Seal all insulation at supports, protrusions and interruptions. Maintain vapor barrier with finish coat.
- Q. Shields:
 - 1. Install between pipe hangers or pipe hanger rolls and inserts. Curved metal shields shall be used between the hangers or support points and at the bottom of insulated pipe.
 - 2. Hangers shall support the load of the insulated pipe section on the outside of the insulation and shall not be in direct contact with the pipe.
 - 3. Manufacturer shall be responsible to size the length of shield required to prevent insulation from breaking.

4. Provide rigid insulation at each support point, a minimum of 2 inches longer than shield length.
5. Curved metal shields shall be designed to limit the bearing stress on the insulation to 35 psi and shall be curved to fit up to mid-perimeter of the insulated pipe.

3.03 EXISTING CHILLED WATER PIPING INSULATED WITH PHENOLIC FOAM INSULATION

A. Re-insulate existing piping systems after repairs have been performed in the same manner as the original installation unless:

1. The nature of damage to the insulation indicates that the system was not insulated properly, and that installation of flashing will be necessary where leaks occur.
 - a. Increasing the thickness of the insulation may be required when condensation occurs.
 - b. Provide insulation expansion joints where large cracks or gaps occur.

B. Materials:

1. When possible carefully remove existing insulation material so it can be reapplied, and provide temporary protection to adjacent insulation material to prevent damage while repairs are underway.
2. When performing a hot tap, maintenance to a strainer, or adding a mechanical component or similar to an operating chilled water system, apply temporary insulation to prevent moisture damage to exposed insulation material. Qualified insulation subcontractor personnel shall assist in the following:
 - a. Strainers; dry the strainer body prior to installing the insulating cap. Ensure that the exposed insulation and insulating cap is dry and free of any contamination. Tape in place then finish with reinforcing mesh and vapor barrier coating.
 - b. Hot tap: to eliminate the possibility of moisture migration into the existing insulation, remove the complete section of the pipe covering where the operation will occur. Apply duct wrap on the raw ends of the adjacent insulation in both directions at a 12 inch length. Use FSK tape to secure the wrap. After completion of the hot tap, remove the temporary insulation and inspect the protected sections to ensure the sections are dry and free from contaminants. Re-insulate and seal the circumferential and longitudinal joints with Foster 30-45 or Childers CP-70. Apply FSK tape at the seams to match the existing facing system.
 - c. Use freezing blankets to install new mechanical components to an existing chilled water piping section. Remove enough insulation to install the freezing blankets plus one additional section in either direction. To eliminate the possibility of moisture migration, remove the complete section of the pipe covering where the operation will occur. Apply duct wrap on the raw ends of the adjacent insulation in both directions at a 12 inch length. Use FSK tape to secure the wrap. After completion of the procedure, remove the temporary insulation and inspect the protected sections to ensure that the insulation sections are dry and free from contaminants. Re-insulate and seal the circumferential and longitudinal joints with a Foster 30-45 or Childers CP-70 or equivalent. Apply tape at the seams to match the existing facing system.

C. Maintenance and Inspection Methods:

1. Conduct periodic inspections as determined by the Owner, to address the following:
 - a. Replace missing insulation and protect adjacent insulation which can become burned or wet after maintenance has been performed to the system.
 - b. Repair leaks or spills and remove and replace damaged insulation.
 - c. Repair breaks, tears, cracks, or punctures of the vapor barrier or protective covering. Verify that the existing insulation is dry and if wet replace the entire affected section as described in this section.
 - d. On piping exposed to the outdoor environment, replace the affected section of insulation as described in this section and use galvanized steel, aluminum or stainless steel to protect the insulation from being crushed due to foot traffic or maintenance equipment. PVC is appropriate for interior areas not subject to foot traffic.

3.04 PIPING INSULATION APPLICATION AND THICKNESS SCHEDULE

- A. In no case shall installed piping insulation have insulation thicknesses that are less than what is required by local energy codes and ASHRAE 90.1 (whichever is more stringent), based on comparable insulation conductivity values at the specified mean rating temperature.
- B. Type 5A and 5B insulation is only used where it is being replaced on existing pipe and thickness of the replacement insulation shall match the existing insulation thickness.

Piping Systems	Location	Type	Pipe Size	Insulation Thickness	
Domestic Cold Water, Soft Water, Make-Up Water (NOTE: Insulation is not required where piping is exposed within equipment rooms.)	Interior Concealed	P1	1-1/2" & Smaller	1/2"	
			2" to 4"	1/2"	
			6" & Larger	1/2"	
	Interior Exposed	P5	1-1/2" & Smaller	3/4"	
			2" to 4"	3/4"	
			6" & Larger	1"	
	Interior Exposed	P6	1-1/2" & Smaller	1"	
			2" to 4"	1"	
			6" & Larger	1-1/2"	
Domestic Cold Water, Soft Water, Make-Up Water	Exterior	P5	All Sizes	1"	
			P6	4" & Smaller	1"
				6" & Larger	1-1/2"
Domestic Hot Water, Tempered Water (Maximum 200 Degrees F)	Interior Concealed	P1	2" & Smaller	1"	
			2-1/2" & Larger	1-1/2"	
	Interior Exposed	P5	1-1/2" & Smaller	3/4"	
			2" to 4"	1"	
		P6	6" & Larger	1-1/2"	
			4" & Smaller	1"	

Piping Systems	Location	Type	Pipe Size	Insulation Thickness	
	Exterior		6" & Larger	1-1/2"	
		P5	All Sizes	1-1/2"	
		P6	All Sizes	1-1/2"	
Fire Protection Water (40 Degrees F – Nominal)	Exterior	P5	4" and Smaller	3/4"	
			6" and Larger	1"	
		P6	4" and Smaller	1-1/2"	
			6" and Larger	3	
Underside of all Roof / Overflow Drain Bodies and related horizontal roof drain lines to vertical leader	Interior Exposed	P5	2" to 4"	3/4"	
			6" and Larger	1"	
		P6	2" to 4"	1"	
			6" and Larger	1-1/2"	
	Interior Concealed	P1	2" to 4"	1/2"	
			6" and Larger	1/2"	
Floor Drain Bodies and related horizontal Sanitary Drain Lines above floor that receive cold condensate drainage.	Interior Exposed	P5	2" to 4"	3/4"	
			6" and Larger	1"	
		P6	2" to 4"	1"	
			6" and Larger	1-1/2"	
	Interior Concealed	P1	2" to 4"	1/2"	
			6" and Larger	1/2"	
Cold Condensate Drain Lines	Interior	P5	All Sizes	3/4"	
			P6	4" and Smaller	1"
		6" & Larger		1-1/2"	
			Interior Concealed	P3	All Sizes
	P6	All Sizes		1"	
	Building Heating Hot Water (Maximum 160 Degrees F)	Interior Exposed	P5	2-1/2" and Smaller	1"
3" and Larger				1-1/2"	
P5			2-1/2" and Smaller	1-1/2"	
			3" and Larger	3"	
Interior Concealed Interior Concealed			P1	2-1/2" and Smaller	1-1/2"
				3" and Larger	2-1/2"
		P5	2-1/2" and Smaller	1"	
			3" and Larger	1-1/2"	
		P6	2-1/2" and Smaller	1-1/2"	
			3" and Larger	2"	
Exterior		P2	2-1/2" and Smaller	1"	
			3" and Larger	1-1/2"	
	P5	2-1/2" and Smaller	1-1/2"		
		3" and Larger	2"		
Chilled Water (Includes Process Chilled Water)	Interior	P6	4" and Smaller	1-1/2"	
			6" and Larger	2"	

Piping Systems	Location	Type	Pipe Size	Insulation Thickness
	Exterior	P6	4" and Smaller	2"
			6" and Larger	3-1/2"
Refrigerant Suction Piping (35 Degrees F – Nominal)	All	P3	2-1/2" and Smaller	3/4"
Non Tempered Domestic Hot Water (Maximum 180 Degrees F)	All	P1	1" and Smaller	1"
			1-1/2" to 2-1/2"	1-1/2"
			3" to 6"	2"
			8" and Larger	2-1/2"
Engine Exhaust	All	P4	Less than 1"	2-1/2"
			1" to 3"	3"
			4" and Larger	4"
Low Pressure Steam, Boiler Feedwater, Steam Condensate Return, Compresses Air Discharge, Boiler Blowdown (201 Degrees F to 250 Degrees F)	All	P1	2-1/2" and Smaller	2"
			3" to 6"	3"
			8" and Larger	3-1/2"
		P4	Less than 1-1/2"	1-1/2"
1-1/2" & Larger	2"			
Medium Temp. Hot Water and Steam (251 Degrees F to 350 Degrees F)	All	P4	Less than 1"	1-1/2"
			1" to 1-1/2"	2-1/2"
			1-1/2" and Larger	3"
High Temp. Hot Water (351 Degrees F to 400 Degrees F) and Steam (351 Degrees F to 600 Degrees F)	All	P4	Less than 1"	2-1/2"
			1" to 4"	3"
			4" and Larger	4"
Brine Systems, Cryogenics (Minus 30 Degrees F to 0 Degrees F)	All	P5	3" and Smaller	2"
			4" and Larger	3"
		P6	4" and Smaller	2-1/2"
			6" and Larger	4"
Brine Systems, Cryogenics (0 Degrees F to 34 Degrees F) Brine Systems, Cryogenics (0 Degrees F to 34 Degrees F)	All	P5	4" and Smaller	1"
			6" and Larger	1-1/2"
		P6	4" and Smaller	1-1/2"
			6" and Larger	2"

END OF SECTION 20 07 19

SECTION 21 10 13 – WET STANDPIPE AND SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Perform all Work required to provide and install pipe, fittings, valves, connections, hangers, supports, sleeves and appurtenances for new, rework and/or expansion of existing wet combination sprinkler and standpipe systems with supplementary items necessary for complete, code compliant and approved installation.
- B. Contractor shall include within his bid all materials and Work to provide standpipe and 100% sprinkler protection for all areas in new construction or for the entire smoke compartment affected by renovation work.
- C. Size all branches and mains by hydraulic calculations. Contractor shall conduct a water flow test to obtain water supply information to determine actual available volume and pressures as a design basis for the system, including storage tank replenishment on new systems. Provide a 10 psi cushion for all hydraulic designs. This Contractor shall verify that the affected existing systems are configured and functioning properly according to NFPA 13. Hazard classifications for fire protection system design, installation and water supplies shall be in accordance with NFPA Standards. EXCEPTION: All pipe sizes and water flow demand for Light Hazard Occupancies shall be based upon Ordinary Hazard (Group 1) as the minimum system design. Sprinkler head locations and spacing for Light Hazard Occupancies shall be in accordance with NFPA 13 requirements.
- D. Interface all new flow and valve supervisory switches with building fire and smoke alarm systems.
- E. Provide temporary fire protection during the construction phase of Project. Inform and obtain approval from the Owner and General Contractor for any interruptions of existing fire protection, domestic water or fire alarm systems.

1.03 QUALITY ASSURANCE

- A. Standpipe and sprinkler system design, testing; cleaning, certification, materials, equipment and installation shall meet the requirements of NFPA standards and City Fire Marshal .
- B. Obtain and become familiar with requirements of Owner's insurance underwriter and incorporate all applicable provisions for compliance.
- C. Thoroughly and clearly document all Project related communications with code and regulatory agents and expediently forward communication documentation to owner Project Manager.
- D. Equipment and components shall bear FM label or UL marking. Provide manufacturer's name and pressure rating marked on valve body.

- E. All hose threads, coupling types, etc., utilized in the fire protection systems shall conform to the standards and requirements of the City of Houston, Texas Fire Department.
- F. Maintain at least one copy of all system related documents on Site.
- G. Design sprinkler system under direct supervision of a R.M.E. experienced in design of this Work and licensed in the State of Texas. All design submittal documents and Shop Drawings shall bear the R.M.E.'s signed and dated registrations number. The system shall be installed by a firm having minimum three years experience regularly engaged in the design and installation of automatic fire protection systems in accordance with requirements of the National Fire Protection Association and the State of Texas Fire Marshal's office.

1.04 SUBMITTALS

A. General:

- 1. All new applications, all rework applications, and all modifications to existing systems shall be submitted for approval as described herein.
- 2. Product data shall be submitted for all size Projects as described herein.

B. Product Data:

- 1. Provide data on sprinkler heads, piping materials, joining methods, supports, valves, flow switches, tamper switches and all other components and accessories intended to be installed. Include manufacturers' catalog information, Code and Standards compliance, performance ratings, rough-in details, weights, finishes, support and connection requirements.
- 2. Submit one of each style of sprinkler head proposed.

C. Record Documents:

- 1. Submit preliminary layout showing head locations within coordinated ceiling grid and inspector's test station locations for review by Architect/Engineer.
- 2. Submit verification of Contractor's design and installation qualifications.
- 3. Provide full written description of manufacturer's warranty.
- 4. Provide certificate of compliance from authority having jurisdiction indicating approval of field acceptance tests. Refer to paragraph 3.04 B, within this specification section.
- 5. Shop Drawings:
 - a. Submit detailed and accurate Shop Drawings electronically of entire systems prior to fabrication. Indicate system controls, hydraulic reference points, detailed pipe layout, valves, hangers and supports, components and accessories.
 - b. Hydraulic calculations: Submit flow test results and comprehensive hydraulic data sheets complying with NFPA 13. Verification of the adequacy of water pressure and other pertinent water supply data shall be the responsibility of the design engineer.

- c. Where expanding existing systems, the submitted design drawings shall show a sufficient amount of the existing system as required, the minimum shall show back to cross main or feed main to clearly identifying how the new work connects to the existing system.

6. As-Built Drawings and Closeout Documentation:

- a. All electronic Record Drawings must meet requirements of Section 01 78 39 – Project Record Documents.
- b. Provide three sets of Record Drawings electronically indicating actual installed locations, sizes and types of sprinkler heads, piping, valves, supports, equipment and all other system components. Identify all deviations from approved submittal drawings.
- c. Provide two sets of final hydraulic calculations.
- d. Submit certification letter by engineer of record stating that the fire protection systems design complies with Referenced Standards.
- e. Submit verification of Contractor's design and installation qualifications.
- f. Provide full written description of manufacturer's warranty.
- g. Provide certificate of compliance from authority having jurisdiction indicating approval of field acceptance tests. Refer to paragraph 3.04 B, within this specification section.
- h. Provide all written exception and authorizations for deviations from this specification.

D. Operation and Maintenance Data:

- 1. Include components of system, servicing requirements, inspection data, replacement part numbers, location and numbers of service depot. Provide a preventive maintenance schedule for all applicable equipment and systems.

1.05 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be new, undamaged, and free of rust. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc.
- B. Accept valves on-site in shipping containers and maintain in place until installation. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.
- C. Protect all materials that are to be installed within this Project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.

1.06 EXTRA MATERIALS

- A. Refer to Section 01 78 46 for Maintenance Materials requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. All piping, materials and equipment used in the installation of sprinkler and standpipe systems shall be new and listed as approved by the Underwriters' Laboratories, Inc., List of Inspected Fire Protection Equipment and Materials and the Factory Mutual Testing Laboratories List of Approved Equipment, Fire Protection Devices and Devices Involving Fire Hazard and shall be the latest design of the manufacturer.
- C. Pressure ratings of pipe, fittings, valves, gauges and all other water carrying appurtenances shall be suitable for the designed system pressures in which they are installed.
- D. The installing Contractor shall identify piping, fire department connections, valves and hydraulic design information in accordance with applicable NFPA Standards.

2.02 MANUFACTURER

- A. Sprinkler Heads: Reliable, Grinnell, Viking, Flexhead.
- B. Flow Switches: Notifier, Potter-Roemer, System Sensor.
- C. Tamper Switches: Notifier, Potter-Roemer, System Sensor.
- D. Gate Valves: Mueller, Nibco, Stockham, Kennedy.
- E. Butterfly Valves: Milwaukee, Nibco, Grinnell, Victaulic, Kennedy.
- F. Ball Valves: Milwaukee, Nibco, Stockham, Victaulic.
- G. Check Valves: Mueller, Nibco, Stockham, Grinnell, Victaulic.
- H. Grooved Fittings and Couplings: Grinnell, Anvil, Victaulic.
- I. Hose Valves: Elkhart, Larsen, Potter-Roemer.
- J. Fire Department Connections: Elkhart, Larsen, Potter-Roemer.
- K. Electric or Water Motor Alarm Bells: Potter-Roemer, Reliable, Victaulic, Grinnell, and Viking.
- L. In-Building Water Supply Riser: Ames.

2.03 SPRINKLER HEADS

- A. Unless otherwise specified or indicated on the drawings, sprinkler heads shall be regular automatic closed type spray heads with temperature ratings as required by National Fire Protection Association Standard No. 13.
 - 1. Heads within smoke compartments containing patient sleeping rooms shall be quick-response type.
 - 2. The installing contractor is to verify the existing type of sprinkler head installed in area of renovation projects to ensure the response type is the same. Standard response and quick heads are not to be mixed in a project.

3. Finished Ceilings: Provide concealed ceiling sprinklers with factory finished (no field painting) cover plate, color to match ceiling finish. [Exception: Provide chrome plated or alternate color cover plates where directed by Architect].
4. Unfinished Areas without Ceilings: Provide bronze upright. Protect sprinkler heads against mechanical injury with standard guards where required.
5. Cold Rooms ($\leq 42^{\circ}\text{F.}$) and Areas below Heated Ceiling/Soffit Spaces Susceptible to Freezing: Provide dry pendant type with chrome finish and two-piece escutcheon. (Areas include but not limited to; walk-in freezers, exterior overhangs, canopies...).
6. Elevator Equipment Rooms: Provide 212°F intermediate temperature classified heads.
7. MRI Rooms: Provide non-ferrous semi-recessed chrome plated head and escutcheon.
8. Animal Vivarium's: Provide recessed heads with gasket covers.

2.04 PIPING MATERIALS

A. Buried Water Service Entrance Piping

1. Pipe - Cement mortar lined ductile iron
2. Fittings – Cement mortar lined ductile iron using mechanical joints
3. Optionally, where building structural components permit, water service entrance may be composed of a single extended 90 degree fitting of fabricated 304 stainless steel tubing, maximum Working pressure of 175 psi with grooved-end connection on the outlet (building) side and a cast iron pipe size coupler on the underground (inlet) side.
4. All pipe and fittings shall be encased with polyethylene film having a minimum thickness of 8 mils.

B. Unburied Piping

1. All pipe and fittings shall be provided with Microbiological Inhibiting Coating (MIC).
2. Pipe
 - a. Interior pipe not subject to freezing shall be Schedule 40 (minimum thickness) black steel.
 - b. Exterior pipe including pipe installed within parking garages shall be Schedule 40 (minimum thickness) galvanized steel.
 - c. Interior pipe subject to freezing shall be Schedule 40 (minimum thickness) galvanized steel.
 - d. Exception: Pipe within MRI rooms and MRI room ceiling space shall be Type "K" hard drawn copper.
3. Fittings
 - a. Fittings shall be threaded malleable or cast iron, flanged cast iron, welded steel or grooved ductile iron with gaskets and mechanical fasteners.
 - b. Exceptions:

- 1) All fittings within MRI rooms and MRI room ceiling spaces shall be wrought copper or bronze pressure and brazed joints.
 - 2) The use of grooved type fittings on pipe size 2 1/2" and smaller in diameter is not allowed.
 - 3) FlexHead: Flexible fire sprinkler hose with threaded end fittings are acceptable.
- c. Groove-less clamp or saddle type fittings shall not be used without specific written authorization from the EH&S program manager for fire & life Safety. The use of galvanize fittings on black steel piping is not acceptable. The use of non-galvanize fittings on galvanize piping is not acceptable.
 - d. All grooved joint couplings, fittings and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacture as the grooved components.

2.05 VALVES

- A. Similar types of valves shall be the product of one manufacturer; i.e., all butterfly valves shall be of the same manufacture, all ball valves shall be of the same manufacture, etc.
- B. All valves used to control the flow of water to and within standpipe and sprinkler systems shall be listed indicating type complete with electric supervisory switches. Coordinate wiring with the electrical Contractor.
- C. Hose valves shall have bronze finish; 2-1/2" hose thread connections with cast brass pin lug cap and chain.
- D. All 1-1/2" hose valves shall be provided with adjustable regulators where required to limit static and residual pressures to 100 psi. All 2-1/2" hose valves shall be provided with adjustable regulators where required to limit static and residual pressures to 175 psi. 2-1/2" hose valves shall be initially set for an outlet pressure of between 125 to 150 psi where allowed by system design.

2.06 FIRE VALVE CABINETS

- A. Provided within Architectural Division 10 of these Specifications.
- B. Coordinate with General Contractor prior to ordering hose valves for compatibility assurance.

2.07 FIRE DEPARTMENT SIAMESE CONNECTIONS

- A. Fire department connections shall have quantity of 2-1/2" hose thread connections as required by system capacity and be complete with cast brass pin lug caps and chains. Finish shall be determined by Architect. Connections shall be identified as required by NFPA 14.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall meet or exceed all applicable requirements and standards identified by Owner Design Guidelines.
- B. All installation shall be in accordance with manufacturer's published recommendations.

- C. Install all materials and products in accordance with manufacturer's published recommendations. Use tools manufactured for the installation of the specific material or product.
- D. Sprinkler heads shall be located in a symmetrical pattern related to ceiling features such as grid, beams, light fixtures, diffusers, etc. and where applicable, heads shall be located symmetrically with the ceiling grid, centered in two directions. Locate heads to provide code required distances away from lights, exit signs, etc., and all other items that could interfere or effect sprinkler discharge.
- E. Cover plates for concealed sprinklers are not to be installed until a field inspection is performed by Environmental Health and Safety to ensure the sprinkler heads are installed at the correct elevation within the ceiling tile as per manufacture product data sheets. The General Contractor on the project is responsible to coordinate this inspection through the owner Project Manager. The project is to maintain, a copy of the manufacture product data sheet on the jobsite for this inspection.
- F. Apply temporary protective covers during construction to ensure that sprinkler heads and escutcheons do not receive field paint.
- G. Install fire sprinkler head cages/guards to sprinkler heads to protect heads susceptible to mechanical injury and to reduce the possible of accidental discharge (i.e. mechanical rooms, elevator shafts/pits, etc.).
- H. Inspector's test valves shall be installed for each sprinkler control valve assembly equipped with a flow switch and piped to a stairwell drain test riser within the building. When used in combination with the drain and test riser requirements for testing standpipes equipped with pressure-regulating hose valves, the drain test riser size shall be a minimum size of 3 inches. Provide a 2-1/2" female test connection with cap on each floor of the 3" test riser with pressure reducing hose valves. Each drain test riser discharge shall be piped to the exterior of the building. The exterior discharge point shall not discharge on a sidewalk, driveway or any other area that could result in staining, water accumulation or soil erosion. When exterior piping is not feasible, the drain test riser shall be piped to a suitable drain having sufficient capacity to accept full flow of pressure-regulating hose valves. When a project cannot meet this requirement, an alternative plan must be submitted for approval by the Project Management team and Environmental Health and Safety, before installation of fire protection system.
- I. Auxiliary drains shall be installed on all sprinkler systems that do not allow complete drainage from the main drain. Any low point areas of a sprinkler system shall have a means of drainage either towards the main drain or auxiliary drain to eliminate any trapped water in the system.
- J. Provide hangers for horizontal piping at intervals not exceeding twelve feet for pipe sizes 1-1/4" and smaller or fifteen feet for pipe sizes 1-1/2" and larger, and as recommended within NFPA.
- K. Route piping in orderly manner, plumb and parallel to building structure and concealed above ceilings where possible. Locate concealed valves, switches and alarm connections in accessible location, and coordinate size and location of access panels/doors with General Contractor.
- L. Install piping to conserve building space and not interfere with use of space and other work. Coordinate with other trades to avoid conflicts and provide all required offsets, piping, auxiliary drains, etc. to properly install system.

- M. Group piping whenever practical at common elevations.
- N. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- O. Flange and coupling bolts shall be torque in sequence per manufacturer specifications.
- P. Pipe joints, clamps, groove couplings, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.
- Q. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- R. Provide an approved splash block at the point of drain or system test discharge outside of the building, where the ground may be disturbed by the flow of water.
- S. Prepare pipe, fittings, supports and accessories for finish painting where required.
- T. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods and properly anchor and support.
- U. Do not penetrate building structural members unless indicated otherwise on Contract Drawings.
- V. Each pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.
- W. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.
- X. Seal all penetrations through exterior building walls and grade beams air and watertight.
- Y. Install valves with stems upright, not inverted. All valves shall be located such that the removal of their bonnets is possible. Valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. Valves shall be installed as nearly as possible to the locations indicated in the Construction Drawings. Any change in valve location must be so indicated on the Record Drawings. Remove protective coatings after installation.
- Z. Provide drain valves at main shutoff valves, low points of piping and apparatus.
- AA. All shutoff and test valves shall be located on the floor they serve.
- BB. Locate and secure hose cabinets plumb and level. Locate angle valve in cabinet at 60 inches above floor.
- CC. Provide two-hour enclosure around all fire standpipe piping routed outside fire stairwell.
- DD. All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary and all rust or dirt from storage or lying on the ground shall be removed. Flush entire system of foreign matter.

EE. Heat generated by welding or soldering procedures shall not be transmitted to valves, groove couplings, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary and allow heated piping to cool to ambient temperature before attachment.

FF. All screw joints shall be made with taper threads properly cut. Joints shall be made tight with Teflon tape or non-toxic joint compound applied to the pipe threads only and not to fittings. When threads are cut on pipes, the ends shall be carefully reamed to remove any burrs. Before installing pipe that has been cut and threaded, the lengths of pipe shall be upended and hammered to remove all shavings and foreign material.

3.02 ELEVATOR SPRINKLER PROTECTION

- A. Elevator fire protection shall comply with NFPA 13, NFPA 70, NFPA 72, and ANSI/ASME A17.1 or A17.3 as applicable.
- B. When sprinklers are installed in elevator equipment rooms, the electrical power to the elevator controller must shut down prior to sprinkler activation. A heat detector shall activate an independently controlled shunt trip circuit breaker when the temperature in the machine room exceeds the setting of the heat detector. The detector shall have both a lower temperature rating and a higher sensitivity (lower Response Time Index) as compared to the sprinkler. Sprinkler heads shall be rated at 212°F and heat detectors shall be rated at 135°F. Heat detectors used to shut down elevator power prior to sprinkler operation shall be placed within two feet of each sprinkler head and connected to the fire alarm control panel.
- C. Smoke detectors shall be provided to initiate phase one elevator recall, sending cars to the appropriate level prior to electrical power shut-down.
- D. No sprinkler risers shall be permitted inside any hoist way. Sprinkler branch lines shall enter hoist ways only where a sprinkler is required.

3.03 WELDED PIPING

- A. Welding of pipe/fittings in normally occupied buildings is prohibited. Offsite welding is acceptable. Should welding be required in a normally occupied building for connecting to an existing welded system, obtain written approval via owner Hot Work Procedure and comply with NFPA 51 B.
- B. All welding materials, procedures, qualifications and records shall comply with applicable NFPA requirements.

3.04 SYSTEM TESTING AND FLUSHING

- A. Testing, cleaning, flushing and inspection shall be done in accordance with NFPA requirements.
- B. The installing Contractor shall complete and sign the appropriate Contractor's Material and Test Certificates included within NFPA 13 and 14. Tests and signing of test certificates shall be witnessed by owner representative or designee.

3.05 ZONING

- A. All flow switches and tamper switches shall relay their activation to each annunciator panel and the main fire alarm panel.

- B. Sprinkler system zoning shall coincide with building smoke compartmentalization unless noted otherwise on Contract Drawings. As a minimum, each floor level shall be a separate zone.

3.06 TRAINING

- A. Contractor shall provide for the service of a competent, trained and experienced agent to instruct and acquaint the Owner with the proper functioning, operation and maintenance of the fire protection systems and all installed components.

3.07 WARRANTY

- A. The complete system shall be warranted in writing against defects in materials or Workmanship under normal use and service for a period of one year after date of Substantial Completion.

END OF SECTION 21 10 13

SECTION 22 10 00 – PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Provide materials and installation for complete first class plumbing systems, within and to five feet beyond building perimeter unless noted otherwise on Contract Drawings; Sanitary Waste and Vent Piping, Storm Drain Piping, Domestic Water Piping, Domestic Water Valves, Testing and other normal parts that make the systems operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. 2015 Edition of the International Plumbing Code.
 - 2. 2012 Uniform Plumbing Code with COH Amendments.
 - 3. NSF/ANSI 61 : Drinking Water System Components - Health Effects.
 - 4. NSF/ANSI 372 : Drinking Water System Components – Lead Content

1.04 QUALITY ASSURANCE

- A. Manufacturer's name and pressure rating shall be permanently marked on valve body.
- B. The Contractor shall notify the manufacturer's representative prior to installing any copper press fittings. The Contractor shall obtain the representative's guidance in any unfamiliar installation procedures. The manufacturer's representative of copper press fittings shall conduct periodic inspections of the installation and shall report in writing to the Contractor and Owner of any observed deviations from manufacturer's recommended installation practices.
- C. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

- D. All grooved joint couplings, fittings, flanges, valves, and specialties of the same type shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as grooved components.
- E. Installer Qualifications:
 - 1. Company shall have minimum three years documented experience specializing in performing the work of this section.
 - 2. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.
 - 3. All installers of copper press fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.
 - 4. All installers of copper grooved fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.

1.05 SUBMITTALS

- A. Product Data:
 - 1. Code and Standards compliance, manufacturer's data for pipe, fittings, valves and all other products included within this specification section.
 - 2. Grooved joint valves, couplings and fittings shall be specifically identified with the applicable style or series designation.
 - 3. Manufacturer's installation instructions.
- B. Record Documents:
 - 1. Record actual locations of valves, etc. and prepare valve charts.
 - 2. Test reports and inspection certification for all systems listed herein.
 - 3. Provide a certificate of completion detailing the domestic water system chlorination procedure and all laboratory test results.
 - 4. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.
 - 5. Provide full written description of manufacturer's warranty.
- C. Operation and Maintenance Data:
 - 1. Include components of system, servicing requirements, Record Drawings, inspection data, installation instructions, exploded assembly views, replacement part numbers and availability, location and contact numbers of service depot.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be new, undamaged, and free of rust.
- B. Accept valves on Site in shipping containers and maintain in place until installation.
- C. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.
- D. Provide temporary end caps and closures on pipe and fittings. Maintain in place until installation.
- E. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris and repair materials as work progresses and isolate parts of completed system from uncompleted parts.
- F. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.

1.07 EXTRA MATERIALS

- A. Refer to Section 01 78 46 for Maintenance Material Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Provide materials as specified herein and indicated on Contract Drawings. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.
- C. Pressure ratings of pipe, fittings, couplings, valves, and all other appurtenances shall be suitable for the anticipated system pressures in which they are installed.

2.02 SANITARY WASTE AND VENT AND STORM DRAINAGE PIPING

- A. Cast iron soil pipe and fittings with hubless connections using clamp type gasketed mechanical fasteners above ground and hub and spigot DWV pipe and fittings with neoprene compression gasket joints for all buried pipe. Cast iron soil pipe, fittings and hub gaskets shall be manufactured by Tyler Pipe or Charlotte Pipe and Foundry. All cast iron pipe and fittings shall be of the same manufacturer.
 - 1. EXCEPTION: Unburied sanitary waste and vent pipe and fittings installed at the Houston Campus (North of Holcombe Boulevard), shall be epoxy coated hubless cast iron soil pipe and fittings manufactured by NewAge Casting.
- B. Secondary (emergency overflow) roof drain piping shall be connected to the primary storm downspout at upper level **(COH). Or Secondary emergency overflow shall be discharged at grade per International Plumbing Code).**

- C. Unburied primary storm drainage and sanitary waste and vent piping for sizes 4" and smaller may be seamless copper DWV tube with wrought copper or wrought copper alloy solder joint drainage pattern DWV fittings.
- D. Indirect waste piping sizes 1-1/4" through 2" serving fixtures and equipment shall be seamless copper DWV tube with wrought copper or wrought copper alloy solder joint drainage pattern DWV fittings.
- E. Indirect waste piping sizes 1" and smaller serving equipment shall be type "L" hard drawn copper pipe and wrought copper or cast copper alloy solder joint fittings using lead-free solder and non-corrosive flux. Elbows shall be long radius type. Tee fittings shall be combination wye with 45 degree elbow.
- F. Cast iron soil pipe compression gaskets shall be monolithically molded from an elastomer meeting ASTM C 564 and shall be of same manufacturer as pipe and fittings.
- G. Clamps for joining hubless cast iron pipe and fittings sizes 1-1/2" through 15" shall meet the performance criteria of FM 1680, have type 304 stainless steel jacket, ASTM C 564 neoprene gasket and type 305 stainless steel band screws designed to be installed with a pre-set torque wrench. Couplings shall be manufactured by Clamp-All, Inc. HI-TORQ 125 or Husky, Inc., Orangesfield SD 4000.
- H. Hubless piping systems shall not be used in a directly buried, underground application. EXCEPTION: No-hub type fittings with clamp type coupling joints may be used below ground for pipe sizes up to 10" at connections to existing cast iron sewers provided couplings are cast iron with stainless steel bolts as manufactured by MG Piping Products.
- I. Solder for copper piping shall be lead-free Tin/Copper/Silver/Nickle(optional) solder conforming to ASTM B32, Lucas Milhaupt Silvabrite 100 Lead-Free Solder or Harris Nick Lead-Free Solder. Use water soluble flux recommended by solder manufacturer and conforming to ASTM B813 and NSF 61, Lucas Milhaupt Silvabrite 100 Water Soluble Flux or Bridgit Water Soluble Paste Flux.
- J. Lubricant for drainage cleanout plugs shall be Loctite Marine Grade Anti-Seize or approved equal by Bostik Chemical Group, or Dow Corning Corporation.
- K. Double sanitary tee fittings shall be not be used as a drainage fitting.
- L. Provide IAPMO figure one, IAPMO figure five or double wye and eighth bend fittings on vertical lines serving back-to-back fixture drains.
- M. Double wye and eighth bend fittings shall not be installed in horizontal drain lines.
- N. All P-traps for floor drains, floor sinks and hub drains shall be deep-seal type.
- O. Provide DWV copper trap adaptors or threaded brass marvel rings to connect fixture waste outlet to service piping within walls. Galvanized nipples shall not be acceptable.

- 2.03 DOMESTIC WATER PIPING (INCLUDES COLD, HOT, SOFTENED WATER & ANIMAL WATERING)
- A. All materials within domestic water distribution systems that may come in contact with the potable water delivered shall be UL classified in accordance with ANSI / NSF-61 for hot and cold potable water service, and shall be certified to the low lead requirements of NSF-372. Manufacturer must provide written documentation of compliance.
 - B. All brass and bronze piping materials within domestic water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.
 - C. Unburied piping shall be type "L" hard drawn copper pipe and wrought copper or cast copper alloy solder joint fittings using lead-free solder and non-corrosive flux. Piping sizes 2-1/2" and larger may be type "L" hard drawn copper and wrought copper or cast copper alloy roll groove fittings Style 607 Quick Vic utilizing no-sweat coupling with NSF 61 and NSF 372 approved gasket for hot and cold water, and flange adaptor Style 641 assemblies as manufactured by Victaulic or Owner approved equal by Anvil.
 - 1. Flaring of tube and fitting ends to IPS dimensions is not allowed.
 - 2. Provide a phenolic flange washer with flange when the mating flange face is not a smooth, hard surface. Refer to manufacturer's installation instructions for additional details.
 - D. Unburied piping sizes 1/2" through 4" installed within occupied buildings for modifying existing systems may utilize copper press fittings when the following conditions are met:
 - 1. Written approval of the Owner's Property Manager shall be obtained prior to bidding.
 - 2. Fittings shall be installed in portions of systems having an operating pressure that will not exceed 200 p.s.i.g.
 - 3. Fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22.
 - 4. O-rings for copper press fittings shall be EPDM. Copper press fittings shall be rated at 200 psi working pressure and 250 degree working temperature.
 - 5. Copper press fittings shall not be used at water supply stub-outs having threaded connections; such as fixture supply stops, flush valves, etc. Solder fittings shall be used at these and similar locations having screwed connections.
 - 6. All copper press fittings, couplings and specialties shall be manufactured by Viega.
 - 7. Installation tools shall be as recommended by the fittings manufacturer.
 - E. Solder for copper piping shall be lead-free Tin/Copper/Silver/Nickle(optional) solder conforming to ASTM B32, Lucas Milhaupt Silvabrite 100 Lead-Free Solder or Harris Nick Lead-Free Solder. Use water soluble flux recommended by solder manufacturer and conforming to ASTM B813 and NSF 61, Lucas Milhaupt Silvabrite 100 Water Soluble Flux or Bridgit Water Soluble Paste Flux.

- F. Buried domestic water service entrance piping 4" and larger shall be cement mortar lined Class 53 ductile iron pipe and 350 psi working pressure ductile iron fittings using mechanical joints. All buried ductile iron pipe and fittings shall be encased in polyethylene per ANSI/AWWA Standard C105/A21.5, Method A. Minimum thickness of polyethylene shall be 8 mil.
 - G. Buried pressurized piping sizes 1" and smaller shall be type "K" soft copper. No joints shall be allowed below slab. Encase piping within ½" thick un-slit flexible tube type elastomeric thermal insulation up to 1" above slab at both ends. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.
 - H. Unburied trap primer piping shall be same as specified for domestic water except all elbows shall be long radius type.
 - I. Buried trap primer piping shall be type "K" soft copper. No joints shall be allowed below slab except at connection to drain. Encase piping within ½" thick un-slit flexible tube type elastomeric thermal insulation up to 1" above slab. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.
 - J. Dielectric waterway fittings shall have a copper-silicon casting or a zinc electroplated steel pipe body with high temperature stabilized polyolefin polymer liner; manufactured by Victaulic, Style 647 or PPP, Inc. Series 19000, or Owner approved equal by Anvil.
 - K. Dielectric unions shall be rated at 250 psi, ground-joint type with inert, non-corrosive thermoplastic sleeve. End connection materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc or Watts. Provide models to suit applicable transitions.
 - L. Dielectric flanges shall be rated at 175 psi, have nylon bolt isolators and dielectric gasket. Materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc or Watts. Provide models to suit applicable transitions.
 - M. Pipe joint compound shall be lead-free, non-toxic, non-hardening and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15°F to +400°F, manufactured by Hercules "MegaLoc" or approved equal by Rectorseal, La-Co or Oatey.
 - N. All exterior water piping sizes 2" and smaller installed above grade shall be provided with electric heat in the form of 120 volt, single phased tape rated at 5 watts per lineal foot at 50°F. Heat tracing shall be manufactured for freeze protection service and be self-regulating to energize at 50°F. Provide an accessible temperature sensing thermostat between electrical power supply and connections to heat tracing to prevent power from activating tracing unless outside ambient temperature is at or below 40°F. This Contractor shall coordinate with the electrical Contractor to provide electrical power supply and connection. Heat tracing shall be by Raychem XL-TRACE or Thermon FLX. Thermostats shall be Raychem AMC-F5 or Thermon N4X-40.
- 2.04 DOMESTIC WATER VALVES: (INCLUDES COLD, HOT, SOFTENED WATER & ANIMAL WATERING)
- A. Similar types of valves shall be the product of one manufacturer; i.e., all butterfly valves shall be of the same manufacturer, all ball valves shall be of the same manufacturer, etc.

- B. Line Shut-Off Valves up to and including 2" shall be two-piece bronze body of ASTM B584 Alloy 844, ASTM B61, or ASTM B62, full port ball type rated at 600 WOG with threaded connections, blow-out proof stem, plastic coated lockable lever handle, Teflon packing, 316 stainless steel ball and stem. Acceptable valves are NIBCO Model T-585-66-LF, or approved equivalent model by Crane, Milwaukee or Apollo.
- C. Line Shut-Off Valves 2-1/2" and larger where system operating pressure will not exceed 160 p.s.i.g. shall be 200 WOG threaded lug type ductile iron body butterfly valve with extended neck, lockable lever handle, 416 stainless steel stem, aluminum bronze disc, EPDM liner and seal, suitable for bi-directional flow and dead end service with downstream flange removed. Acceptable valves are NIBCO Model LD-2000, or approved equivalent model by Keystone, Jamesbury, Milwaukee, Crane or Apollo.
- D. Line Shut-Off Valves 2-1/2" and larger installed within systems having design operating pressures between 160 and 250 p.s.i.g. shall be threaded lug type ductile iron body butterfly valve with extended neck, lockable lever handle, 316 stainless steel stem and disc, EPDM liner and seal, suitable for bi-directional flow and dead end service with downstream flange removed. Acceptable valves are NIBCO Model LD-3022, or approved equivalent model by Keystone, Jamesbury, Dezurik, Milwaukee, Crane or Apollo.
- E. Line Shut-Off Valves 2-1/2" and larger installed in roll grooved copper systems may be 300 psi roll grooved end type bronze body butterfly valve with lockable lever handle, aluminum bronze disc, with pressure responsive Grade CHP Fluoroelastomer seat, stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating, suitable for bi-directional flow and dead end service. Manufactured by Victaulic Series 608N or Anvil Model B680.
- F. Provide stem extensions of a non-thermal conducting material for valves in insulated lines to allow unobstructed operation.
- G. Provide memory stops on all ball valves installed in domestic hot water return lines. Memory stops shall be adjustable after pipe insulation is applied.
- H. Provide line shut-off valves that have the same inside diameter of the upstream pipe in which they are installed.
- I. Domestic Hot Water Return Circuit Balancing Valves 1/2" through 3" shall be machined ball type calibrated balancing valve with lead free ASTM B283-C69300 Brass body/304 Stainless Steel ball construction, glass and carbon filled TFE seat rings, EPDM stem "O" ring, threaded NPT inlet/outlet connections, 400 psig maximum working pressure at 250°F. Valve shall have differential pressure read-out ports across valve seat area fitted with internal EPT inserts/check valves. Valve body shall have 1/4" NPT tapped drain/purge port. Valve shall have calibrated nameplate and memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. Valve shall contain less than 0.25% lead content by weight on wetted surfaces and be designed for positive shut-off.. Valves shall be same size as the pipe installed. Provide valves as scheduled on Contract Drawings manufactured by Bell & Gossett Circuit Setter Plus CB series, or Owner approved equal.
- J. Swing Check Valves, 2" and smaller - "Y" pattern bronze, Class 125, with threaded connections and screw-in cap. Manufactured by NIBCO Model T-413-Y-LF or approved equivalent model by Milwaukee or Crane.

- K. Spring Loaded Check Valves, 2" and smaller - Silent closing, bronze, Class 125, with threaded connections, Buna disc, bronze or stainless steel spring. Manufactured by NIBCO Model T-480-LF or approved equivalent model by Milwaukee or Crane.
- L. Swing Check Valves, 2-1/2" and larger - 200 pound CWP, Iron body, with bronze or stainless steel trim. Manufactured by NIBCO Model F-918-B-LF or approved equivalent model by Milwaukee or Crane.
- M. Swing Check Valves, 2-1/2" and larger - 285 pound CWP, Iron body, with stainless steel trim. Manufactured by NIBCO Model F-938-33-LF or approved equivalent model by Milwaukee or Crane.
- N. Spring Loaded Check Valves, 2-1/2" and larger - 200 pound CWP, Iron body, with bronze or stainless steel trim. Manufactured by NIBCO Model F-910-LF or approved equivalent model by Milwaukee or Crane.
- O. Spring Loaded Check Valves, 2-1/2" and larger - 400 pound CWP, Iron body, with bronze or stainless steel trim. Manufactured by NIBCO Model F-960-LF or approved equivalent model by Milwaukee or Crane.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry and not over-excavated. Do not install underground piping when bedding is wet or frozen.
- B. Before commencing work, check final grade and pipe invert elevations required for drain terminations and connections to ensure proper slope.

3.02 PREPARATION

- A. Ream pipes and tubes. Remove burrs, scale and dirt, inside and outside, before assembly. Remove foreign material from piping.
- B. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. General
 - 1. Care shall be exercised to avoid all cross connections and to construct the plumbing systems in a manner which eliminates the possibility of water contamination.
 - 2. Install all materials and products in accordance with manufacturer's published recommendations. Use tools manufactured for the installation of the specific material or product.
 - 3. Wipe all paste residue and excess solder from all solder joints.

4. Heat generated by soldering procedures shall not be transmitted to valves, copper alloy roll groove fittings, copper press fittings, no-hub clamps, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary, including utilizing wet wrapping or allowing heated piping to cool to ambient temperature before attachment.
5. Pipe joints, no-hub clamps, flanges, unions, etc., shall not directly contact or be encased in concrete.
6. Route piping in direct orderly manner and maintain proper grades. Installation shall conserve headroom and interfere as little as possible with use of spaces. Route exposed piping parallel to walls. Group piping whenever practical at common elevations.
7. Install piping to allow for expansion and Contraction without stressing pipe, joints or connected equipment.
8. Furnish all supports required by the piping included in this specification section.
9. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.
10. Seal all penetrations through floors, exterior building walls and grade beams air and water tight.
11. Each plumbing pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.
12. Furnish and install all necessary valves, traps, gauges, strainers, unions, etc. for each piece of equipment (including Owner furnished equipment) having plumbing connections, to facilitate proper functioning, servicing and compliance with code.
13. Provide code-approved transition adaptors when joining dissimilar piping materials. Adaptors installed shall be manufactured specifically for the particular transition.
14. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.
15. Close nipples shall not be installed in plumbing piping systems.
16. Bury outside water and drainage pipe minimum one foot below recorded frost depth.
17. Buried piping shall be supported throughout its entire length.
18. All excavation required for plumbing work is the responsibility of the plumbing Contractor and shall be done in accordance with Contract Documents.
19. Piping shall be insulated in accordance with Contract Documents.
20. Provide clearance for installation of insulation and for access to valves, air vents, drains, unions, etc.

21. Provide dielectric isolation device where non-ferrous components connect to ferrous components. Devices shall be dielectric union, coupling or dielectric flange fitting.
22. All piping shall be isolated from building structures, including partition studs, to prevent transmission of vibration and noise.
23. Isolate all bare copper pipe from ferrous building materials. "Tape is not an acceptable isolator.

D. Drainage and Vent Systems

1. Slope drainage lines uniformly at 1/4" per foot, for lines 3" and less, and 1/8" per foot for larger lines, unless noted otherwise on Contract Drawings. Maintain gradients through each joint of pipe and throughout system.
2. Buried pipe shall be laid on a smoothly graded, prepared subgrade soil foundation true to alignment and uniformly graded. Bell holes shall be hand-excavated so that the bottom of the pipe is in continuous contact with the surface of the prepared subgrade material. Piping invert shall form a true and straight line.
3. The size of drainage piping shall not be reduced in size in the direction of flow. Drainage and vent piping shall conform to the sizes indicated on the Contract Drawings. Waste lines from water closets shall not be smaller than four inches. Under no circumstances shall any drain or vent line below slab be smaller than two inches.
4. Unburied horizontal cast iron soil piping shall be supported at least at every other joint except that when the developed length between supports exceeds four feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection and at the base of each vertical rise. Supports shall be placed immediately adjacent to the joint. Suspended lines shall be braced to prevent horizontal movement. Unburied vertical cast iron soil piping rising through more than one floor level shall be supported with riser clamps at each floor level.
5. Install couplings for hubless pipe and fittings in accordance with manufacturer's published recommendations. Use pre-set torque wrench and tighten band screws as required by manufacturer's published instructions.
6. All unburied change of direction fittings within the roof drainage system shall be braced against thrust. Bracing shall incorporate galvanized steel pipe clamps and tie rods.
7. Provide cleanouts within sanitary waste systems at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs.
8. Provide cleanouts at the base of each vertical downspout and at intervals not exceeding 75 feet in horizontal building storm drain. Provide clearances as required by code. Horizontal roof drain piping located above building ground floor level will not require cleanouts.
9. A removable sink or lavatory p-trap with cleanout plug shall be considered as an approved cleanout for 2" diameter pipe.

10. All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible. A floor cleanout shall be installed only where installation of a wall cleanout is not practical.
11. Provide a wall cleanout for each water closet or battery of water closets. Locate wall cleanouts above the flood level rim of the highest water closet but no more than twenty four inches above the finished floor.
12. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.
13. Lubricate cleanout plugs with anti-seize lubricant before installation. Prior to final completion, remove cleanout plugs, re-lubricate and reinstall using only enough force to provide a water and gas tight seal.
14. Install trap primer supply to floor drains, hub drains and floor sinks that are susceptible to trap seal evaporation and where indicated on Project Drawings. Primer unit installation shall comply with manufacturer's published recommendations. Trap primer lines shall slope to drain at a minimum $\frac{1}{4}$ " per foot.
15. Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 24" from active main. Waste connections and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.
16. Unless indicated otherwise within Contract Documents, all sanitary vent pipes passing through the roof shall be provided with lead roof flashings constructed of 2-1/2 pound sheet lead with bases extending no less than ten inches on each side of the pipe. The vertical portion of the flashing shall extend upward the entire length of pipe and be turned tightly inside the pipe at least two inches and shall not reduce the inside diameter of vent pipe more than the thickness of the flashing. Lead flashings shall be furnished by Plumbing Contractor and turned over to Roofing Contractor for installation.
17. Locate all sanitary vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes, operable windows, doors and any other building openings.
18. Wastewater when discharged into the building drainage system shall be at a temperature not higher than 140°F. When higher temperatures exist, approved cooling methods shall be provided.

E. Domestic Water System

1. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide and install an approved vacuum breaker or backflow preventer. Installation of vacuum breakers shall prevent any possible backflow through them.
2. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with $\frac{3}{4}$ " rods, and properly anchor and support. Restraining rods, clamps and hardware shall be thoroughly coated with bituminous material to prevent corrosion.

3. Copper piping shall be supported at no greater than six foot intervals for piping 1-1/2" and smaller and ten foot intervals for piping 2" and larger in diameter.
 4. Install all water piping to allow all piping within the system to be drained at low points.
 5. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be installed within domestic water systems. Valves installed for future connections shall not extend more than 24" from an active main.
 6. Provide manufactured water hammer arrestors in water supply lines as indicated on Contract Drawings and in accordance with Standard PDI-WH201.
 7. Pipe insulation shall be applied over installed freeze protection heat tracing tape.
 8. Install union type fitting downstream of isolation valves at equipment connections.
 9. Solder joint fittings shall not be installed within 24" of a copper press fitting.
 10. Identify piping utilizing copper press fittings in accordance with project specification section 20 05 53.
- F. Domestic Water Valves
1. Domestic water shut-off valves shall be installed where shown on Drawings, at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, and at each battery of fixtures.
 2. Install shut-off valves in accessible locations. Provide access panels where valves would otherwise be inaccessible. Coordinate quantity, size and location requirements of access panels with General Contractor.
 3. When altering or connecting to existing domestic water systems, verify that existing line shut-off valves provide positive isolation from the sections of piping serving areas outside of the Project Boundaries. Install new line shut-off valves where valves do not exist to provide positive isolation.
 4. Install shut-off valves with stems upright or horizontal, not inverted.
 5. Where threaded valves are installed in copper piping systems special care shall be taken to avoid damaging the valve or its parts due to overheating. Install copper or bronze male adaptors in each inlet of threaded valves. Sweat solder adaptors to pipe prior to connecting to valve body.
 6. Provide spring loaded type check valves on discharge of water pumps.
 7. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.
 8. Install a shutoff valve immediately upstream of each strainer

9. Install domestic hot water return circuit balancing valves where indicated on Contract Drawings and locate a minimum length of unrestricted straight pipe diameters downstream and upstream of all fittings and/or line shut-off valves as recommended by the valve manufacturer. Location of valves shall allow unobstructed access for monitoring and adjustment.
10. Adjust and set domestic hot water return circuit balancing valves to flows indicated on Contract Drawings and in accordance with valve manufacturer's published instructions. Use flow meter recommended by valve manufacturer.
11. Provide a line shut-off valve, strainer, temperature gauge and union, upstream of each hot water return circuit balancing valve.
12. Provide check valve and isolation valve immediately downstream of each hot water return circuit balancing valve.

3.04 TESTING AND CLEANING

A. General

1. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 01 and Special Condition requirements of this Contract.
2. For any requested inspection, the Contractor shall complete prior inspections and tests to ensure that items are ready for inspection and acceptance by the Owner and/or Architect/Engineer. The Contractor shall be responsible for any and all costs incurred by Owner and/or Owner representatives, including consultants, resulting from a review or inspection that was scheduled prematurely.
3. The Contractor shall conduct the tests and the Owner's Construction Inspector will witness and approve the results.
4. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test and inspect for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Piping being tested shall not leak nor show any loss in test pressure for duration specified.
5. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.
6. In cases of minor installation and repairs where specified water and/or air test procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate testing and inspection procedures. Alternate testing and inspection procedures for minor installation and repairs shall include visual evaluation of installed components by Owner's Representative during a simulation of use.
7. The water utilized for tests shall be obtained from a potable source of supply.

8. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.
9. Gauges used for testing shall have increments as follows:
 - a. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
 - b. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.
 - c. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.
10. Separately test above and below ground piping.
11. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.
12. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner's Representative to determine areas and/or equipment considered as being sensitive.
13. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.
14. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.

B. Drainage and Vent System

1. Testing:
 - a. Subject gravity drainage and vent piping and joints to a vertical water column pressure of at least ten feet. If after 12 hours the level of the water has been lowered by leakage, the leaks must be found and stopped and the water level shall again be raised to the level described and the test repeated until, after a 12 hour retention period, there shall be no perceptible lowering of the water level in the system being tested. This pressure shall be held for a test period of at least 15 minutes while being witnessed by the Owner's Representative.

- 1) Portions of drainage and vent piping located on uppermost level of building shall be subjected to a water column pressure created by filling the system to point of overflow at roof vent terminals and roof drains. The pipes for the level being tested shall be filled with water to a verifiable and visible level as described above and be allowed to remain so for 12 hours. This pressure shall be held for a test period of at least 15 minutes while being witnessed by the Owner's Representative.
- b. Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with air. Isolate the test section from all other sections and slowly fill pipe with oil-free air until there is a uniform gauge pressure of 5 pounds per square inch (34.5 kPa) or sufficient pressure to balance a 10-inch (254 mm) column of mercury. The air pressure shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 PSIG. This pressure shall be held for a test period of at least 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperature or the seating of gaskets shall be made prior to the beginning of the test period. This pressure shall be held for a test period of at least 15 minutes while being witnessed by the Owner's Representative.
2. Test forced (pumped) drainage piping by plugging the end of the piping at the point of connection with the gravity drainage system and applying a pressure of 5psi (34.5 kPa) greater than the pump rating, and maintaining such pressure for 15 minutes while being witnessed by the Owner's Representative.
3. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner's Representative.
4. Test plugs must extend outside the end of pipe to provide a visible indication for removal after the test has been completed.
5. Cleaning and Flushing:
 - a. During the Plumbing Systems Functional Performance Tests, each floor drain p-trap that has successfully passed pressure testing shall be proven clean and free of debris as follows:
 - 1) An inspection request shall be submitted to the Owner, identifying the quantity and location of drain(s) to be inspected.
 - 2) Vacuum out each floor drain p-trap in the presence of the Owner's Representative. A visual inspection of the trap shall be performed to verify that the trap is debris free.
 - 3) Perform a free flowing test by pouring two five gallon buckets of water down the floor drain.
 - 4) After the Owner's Representative has confirmed that the floor drain trap is clean and free of debris, insure that the trap is filled with water.
 - 5) Install Trap Guard if required.

6) At the discretion of the Owner's Representative, a visual inspection of the trap utilizing a sewer scope may be required in addition to, or in lieu of, a vacuum procedure.

b. During the Plumbing Systems Functional Performance Tests, the Owner's Representative may require that any portion of the drainage, waste and vent systems installed under this Project Contract be proven undamaged, clean and free of debris. Verification of the interior condition of piping shall be accomplished utilizing a sewer scope or other method as determined by the Owner's Representative.

C. Domestic Water System

1. Testing:

a. Subject piping system to a hydrostatic pressure of at least 125 pounds per square inch gauge, but not less than the operating pressure under which it is to be used, for a period of no less than 12 hours. During test period, all pipe, fittings and accessories in the particular piping system that is being tested shall be carefully inspected. If leaks are detected, such leaks shall be stopped and the hydrostatic test shall again be applied. This procedure shall be repeated until no leaks are detected for an entire 12 hour period. This pressure shall be held for a test period of at least 15 minutes while being witnessed by the Owner's Representative.

b. EXCEPTION: Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with oil-free air in lieu of water.

c. All domestic hot water systems that include a secondary copper/silver disinfection system shall be balanced and background copper testing completed prior to activation. Background copper (CU) content shall be less than 0.30 PPM..

2. Flushing, Cleaning and Disinfection:

a. Where specified procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate flushing, cleaning and/or disinfection procedures.

b. All active existing domestic water piping and plumbing fixtures within the Project Boundaries that will remain in service after completion of this Project shall be periodically flushed during the duration of the Project to insure potability and sanitation.

1) Operate all plumbing fixtures and equipment that is connected to the domestic water system twice each week on Monday and Friday as follows:

a) Flush each water closet and urinal.

b) Flush water outlets (hot & cold) for a minimum of three minutes on each lavatory, sink, shower, drinking fountain, hose bib, and all other connected fixtures/equipment.

- c. All existing water piping within the Project Boundaries that will remain in service after completion of this Project and has been dormant for two weeks or longer shall be flushed and disinfected as required within this specification section.
- d. A bacteria test is not necessary for small scale work. However, disinfection is required. Examples of small scale work are less than 20 feet of pipe, replacement and/or installation of a sink, drinking fountain, eyewash, backflow preventer, isolation valve, etc. Disinfect individual parts, fixtures, isolation valves, pipes, etc. by swabbing with full strength bleach (5.25%) or soaking for at least 30 minutes in a 500 ppm chlorine solution. The 500 ppm solution can be made by adding one part 5.25% bleach (household bleach) to 100 parts drinking water. For example 3-1/2 ounces of bleach can be added to 2-1/2 gallons drinking water. Materials should then be thoroughly rinsed before putting into service.
- e. After completion of the testing, all new and/or altered water piping systems shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. Do not exceed 150 parts per million at any time. Introduce chlorine into the supply stream at a rate sufficient to provide a uniform concentration throughout the system. All outlets shall be opened and closed several times. When the specified level of chlorine is detected at every outlet in the system, close all valves to prevent release of water from the system for 24 hours. At the completion of the 24 hour disinfection period, test every outlet for a minimum chlorine residual of fifty parts per million. This minimum residual must be present to proceed with flushing. Flush the system with clean water at a sufficient velocity until the residual chlorine detected at every outlet is within 0.2 parts per million of the normal water supply's level.
- f. Sufficient samples must be taken no sooner than 24 hours after sterilization and flushing to represent the extent and complexity of the affected water system, along with a control sample to indicate municipal water quality at the time of testing. Send water samples to an accredited laboratory to perform qualitative and quantitative bacteriological analysis in accordance with AWWA C651. Contractor shall obtain written certification from the independent testing agency stating that the water samples meet Federal and State guidelines for safe drinking water. Upon satisfactory completion of all procedures, and receipt of acceptable laboratory test results, obtain written approval by Owner's representative. Failure to fully comply with the above procedures will result in a requirement to repeat the procedure until acceptable results are achieved, at no additional cost to the Owner.
- g. Isolate or bypass equipment that would be detrimentally affected by disinfecting solution. Isolate all other sections of the domestic water system not being disinfected to prevent migration of chlorine.
- h. Prior to injection of chlorine into the piping system, strategically place signs stating "Heavily Chlorinated Water - Do Not Drink", and protect all outlets to prevent use during disinfection and flushing procedures.
- i. All domestic hot water systems that include a secondary copper/silver disinfection system shall be flushed as described within 3.04 C.2.b.1) for no less than 90 days prior to activation of the secondary copper/silver disinfection system. Maintain records of flushing procedure and submit to Owner for verification.

3.05 TRAINING

- A. Obtain services of the copper press fitting manufacturer to provide on-site training for Contractor's field personnel in the use of pressing tools and installation of fittings. The manufactures representative shall periodically visit the jobsite and provide the contractor information concerning the best recommended practices in product installation. A distributor's sales representative is not considered qualified to conduct the training or jobsite visit(s).
- B. Obtain services of the grooved copper fitting manufacturer to provide on-site training for Contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved end couplings. The manufactures representative shall periodically visit the jobsite and provide the contractor information concerning the best recommended practices in grooved product installation. A distributor's sales representative is not considered qualified to conduct the training or jobsite visit(s).

END OF SECTION 22 10 00

SECTION 22 10 30 – PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Provide all materials and installation for plumbing specialties within building domestic water, sanitary waste and storm drainage systems; floor drains, floor sinks, hub drains, roof drains, cleanouts, backflow preventers, vacuum breakers, pressure regulating valves, water hammer arrestors, wall hydrants, hose bibbs, trap primer units, strainers, temperature gauges, pressure gauges and other normal parts that make the systems complete, operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. 2015 Edition of the International Plumbing Code.
 - 2. ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 QUALITY ASSURANCE

- 1. Manufacturer's name and pressure rating shall be permanently marked on valve body.
- 2. All materials shall be new, undamaged, and free of rust. Protect installed products and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris as work progresses.
- 3. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

4. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the work of this section. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

1.05 SUBMITTALS

A. Product Data:

1. Provide Code and Standards compliance, component dimensions, service sizes and finishes.

B. Record Documents:

1. Manufacturer's certification documentation for backflow preventers.
2. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.
3. Provide full written description of manufacturer's warranty.
4. Record actual locations of plumbing specialties installed.

C. Operation and Maintenance Data:

1. Include testing procedures for backflow preventers, adjustment procedures for water pressure regulating valves.
2. Include installation instructions, exploded assembly views, servicing requirements, inspection data, installation instructions, spare parts lists, replacement part numbers and availability, location and contact numbers of service depot, for all plumbing specialties installed

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept specialties on site in shipping containers and maintain in place until installation.
- B. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.
- D. Protect all materials before and after installation from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for installation within exterior environments.

1.07 EXTRA MATERIALS

- A. Refer to Section 01 78 46 for Maintenance Material Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Provide plumbing specialties as indicated and scheduled on the Contract Drawings and as specified herein. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.
- C. Pressure and temperature ratings of plumbing specialties shall be suitable for the anticipated system pressures and temperatures in which they are installed.
- D. All materials within domestic water distribution systems that may come in contact with the potable water delivered shall be UL classified in accordance with ANSI / NSF-61 for hot and cold potable water service, and shall be certified to the low lead requirements of NSF-372. Manufacturer must provide written documentation of compliance..
- E. All brass and bronze plumbing specialties within domestic water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.
- F. Specialties of same type shall be product of one manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

- A. Floor Drains: Wade, Zurn, Smith, Josam.
- B. Floor Sinks: Wade, Zurn, Smith, Josam.
- C. Roof Drains: Wade, Zurn, Smith, Josam.
- D. Wall/Floor Cleanouts: Wade, Zurn, Smith, Josam.
- E. Backflow Preventers and Vacuum Breakers: Watts Regulator, Febco, Conbraco.
- F. Water Pressure Regulating Valves: Wilkins, Watts Regulator, Cla-Val.
- G. Water Hammer Arrestors: Wade, Zurn, Smith, Josam.
- H. Wall Hydrants: Wade, Zurn, Smith, Josam.
- I. Hose Bibbs: Chicago.
- J. Trap Primer Units: As Specified Herein
- K. Strainers: Conbraco, Wilkins, Watts
- L. Temperature Gauges: Ashcroft, Terice, Weksler
- M. Pressure Gauges: Ashcroft, Terice, Weksler

2.03 FLOOR DRAINS (FD)

- A. All floor drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted.
- B. Each floor drain shall be provided with a deep-seal p-trap unless noted otherwise.
- C. Floor drains installed for general floor area drainage within toilet rooms and other finished spaces shall have cast iron body with flange, adjustable top and sediment bucket, integral reversible clamping collar, seepage openings, 1/2" plugged primer tap, and 6" diameter nickel bronze or stainless steel strainer with vandal proof screws.
- D. Floor drains installed for general floor area drainage and light to medium flow indirect equipment discharge within mechanical rooms shall have cast iron body with plugged 1/2" primer tap, integral clamping collar, seepage openings, adjustable top and 11-1/2" diameter ductile iron loose set tractor grate.
- E. Floor drains installed for non-monolithic shower stall floors shall have cast iron body with flange, adjustable top, integral reversible clamping collar, seepage openings and 5" diameter nickel bronze or stainless steel strainer with vandal proof screws.
- F. All floor drains shall be as sized and scheduled on Contract Drawings.

2.04 FLOOR SINKS (FS)

- A. All floor sinks shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted.
- B. Each floor sink shall be provided with a deep-seal p-trap unless noted otherwise.
- C. Floor sinks installed for general floor area drainage shall have 8" round cast iron body with 3" sump, acid resistant enamel interior, aluminum dome strainer, seepage flange, membrane clamping device and 7-3/8" diameter stainless steel or nickel bronze top.
- D. Floor sinks installed to receive indirect equipment discharge shall have cast iron 12" square body with 8" sump, acid resistant enamel interior, aluminum dome strainer, seepage flange, membrane clamping device and stainless steel top. Top shall be 1/2" or 3/4" grate as scheduled on Drawings.
- E. All floor sinks shall be as sized and scheduled on Contract Drawings.

2.05 HUB DRAINS (HD)

- A. Hub drains shall be cast iron soil pipe manufactured hubs or hub adapters. Field cut no-hub or plain-end pipe stub-ups are not acceptable.
- B. Each hub drain shall be provided with a deep-seal p-trap.

2.06 ROOF DRAINS (RD)

- A. Primary roof drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted and have lacquered cast iron body with sump, removable cast iron or bronze dome strainer, flashing flange and clamp, gravel stop, deck clamp and drain receiver. Provide extension where required.
- B. Secondary (emergency overflow) roof drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted and have minimum 2" high water dam, acid resistant epoxy coated cast iron body and sump, removable bronze dome strainer, flashing flange and clamp, gravel stop, deck clamp and drain receiver. Provide extension where required.
- C. Roof drains shall be sized as indicated on Contract Drawings.

2.07 CLEANOUTS:

- A. Cleanouts shall be the same nominal size as the pipe they serve up to four inches.
- B. Cleanouts shall have cast iron body with tapered cast brass or bronze plug providing gas and watertight seal.
- C. Interior floor cleanouts shall have stainless steel or nickel bronze scoriated top. Provide carpet marker when installed in areas to be covered by carpet.
- D. Exterior cleanouts at grade shall have scoriated cast iron top.
- E. Wall cleanouts shall be provided with stainless steel access covers of adequate size to allow rodding of drainage system. Wall cleanouts incorporating cover screws that extend completely through the access plug are not acceptable.

2.08 BACKFLOW PREVENTERS (INCLUDES BACKPRESSURE AND BACKSIPHONAGE)

- A. Reduced Pressure Zone Type (Not For Use In Fire Protection Water Supply):
 - 1. The assembly shall meet the requirements of ASSE 1013, AWWA C511.
 - 2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel. The assembly shall include two tightly closing shutoff valves before and after the valve and test cocks.
 - 3. Test cocks
 - 4. Seats: Bronze, removable and replaceable without removing valve from the line.
 - 5. Checks: Independently operating.
 - 6. Relief Valve: Independently operating, located between the two check valves.
 - 7. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 140°F.

8. Unit to be complete with vent-port funnel to maintain the air gap and to provide a drain connection point.
 9. Sizes 1/4" and 1/2" - Bronze body, bronze strainer, upstream and downstream quarter-turn ball valves, union connections: Watts Regulator Company Series 009.
 10. Sizes 3/4" through 2" - Bronze body, bronze strainer, upstream and downstream quarter-turn ball valves, union connections: Watts Regulator Company Series 909.
 11. Sizes 2-1/2" through 10" - FDA epoxy coated cast iron body, FDA epoxy coated strainer, upstream and downstream OSY – UL/FM outside stem and yoke resilient seated gate valves, flange connections: Watts Regulator Company Series 909.
- B. Reduced Pressure Zone Type (For Use In Fire Protection Water Supply):
1. The assembly shall meet the requirements of ASSE 1013, be U.L. classified and FM Approved.
 2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel. The assembly shall include two tightly closing shutoff valves before and after the valve and test cocks.
 3. Test cocks
 4. Replaceable seats
 5. Checks: Independently operating.
 6. Relief Valve: Independently operating, located between the two check valves.
 7. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 110°F.
 8. Unit to be complete with vent-port funnel to maintain the air gap and to provide a drain connection point.
 9. Sizes 2-1/2" through 10" - Schedule 40 stainless steel body, upstream and downstream UL/FM outside stem and yoke resilient seated gate valves or UL/FM grooved gear operated butterfly valves with tamper switches: Watts Regulator Company Series 957.
- C. Double Check Valve Assembly (Not for Fire Protection Water Supply):
1. The assembly shall meet the requirements of ASSE 1015, AWWA C510
 2. Top entry access points for each check assembly
 3. Replaceable seats
 4. Test cocks
 5. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 140°F.

6. Sizes 1/2" through 2" - Bronze alloy body, bronze strainer, upstream and downstream quarter-turn ball valves, union connections: Watts Regulator Company Series 719.
 7. Sizes 2-1/2" through 10" - FDA epoxy coated cast iron body, FDA epoxy coated strainer, upstream and downstream OSY – UL/FM outside stem and yoke resilient seated gate valves, flange connections: Watts Regulator Company Series 709.
- D. Double Check Valve Assembly (For Use In Fire Protection Water Supply):
1. The assembly shall meet the requirements of ASSE 1015, be U.L. classified and FM Approved.
 2. Two independent tri-link check modules within a single housing
 3. Sleeve access port
 4. Four test cocks
 5. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 110°F.
 6. Sizes 2-1/2" through 10" - Schedule 40 stainless steel body, upstream and downstream UL/FM outside stem and yoke resilient seated gate valves or UL/FM grooved gear operated butterfly valves with tamper switches: Watts Regulator Company Series 757.
- E. Continuous Pressure Vacuum Breaker (Not For Use In Fire Protection Water Supply. Not to be used for backpressure protection):
1. Tested and certified under ASSE Standard 1056.
 2. Suitable for continuous pressure hot and cold water.
 3. Brass body and seat with silicon rubber discs.
 4. Rated maximum pressure 150 psi and working temperature 33 to 180 degrees F.
 5. Complete with quarter turn ball valves and test cocks.
 6. Sizes 3/8" through 1" - Spill-resistant, Watts Regulator Company Series 008PCQT.
- F. Dual Check Valves (For Use in Beverage Dispenser Water Supply):
1. Certified to ANSI/NSF Standard 18.
 2. Tested and certified under ASSE Standard 1022.
 3. Atmospheric port
 4. 316 stainless steel body
 5. Rated maximum pressure 150 psi and working temperature 33 to 130 degrees F.
 6. Sizes 1/4" and 3/8" – Watts Regulator Company Series SD-3.

2.09 WATER PRESSURE REGULATING VALVES

A. Low to Moderate Flow Systems (Less Than 70 GPM) and Individual Equipment

1. Sizes 1/2" through 2"
2. All bronze body
3. 0.25% maximum weighted average lead content
4. Integral stainless steel strainer screen
5. Built-in bypass check valve
6. FDA approved elastomers
7. Renewable seat
8. Union end connection
9. Rated for water temperature up to 180°F and minimum 300 psi inlet pressure. Provide model with inlet pressure rating, reduced pressure range and factory preset outlet pressure as scheduled on Contract Drawings.
10. Manufactured by Wilkins Series 600XL or approved equal by Watts.

B. Large Demand Systems

1. Sizes 1-1/4" through 2 - ASTM B62 bronze body
2. Sizes 2-1/2" and larger - ASTM A536 ductile iron body
3. Pressure reducing pilot control
4. Stainless steel disc guide, seat and bearing cover
5. Stainless steel stem, nut and spring
6. FDA approved Nylon reinforced Buna-N rubber diaphragm
7. Provide model(s) with size, temperature range, inlet pressure rating, reduced pressure range, outlet pressure and options as scheduled on Contract Drawings.
8. Cla-Val Company Series 90 or approved equal by Watts.

2.10 WATER HAMMER ARRESTORS (SHOCK ABSORBERS):

- A. Nesting type bellows operated water hammer arrestor with male N.P.T. connection. Bellows and body casing made of Type 304 stainless steel. Water hammer arrestors shall be certified to the PDI WH-201 Standard and ASSE Standard 1010.
- B. Arrestors shall be designed and manufactured for a maximum working temperature of 250F and maximum operating pressure of 125 P.S.I.G.
- C. Water hammer arrestors shall be sized according to water hammer arresters standard PDI-WH-201 and as indicated on Contract Drawings.

2.11 WALL HYDRANTS (WH)

- A. Provide antisiphon, non-freeze wall hydrant with brass casing, integral backflow preventer, vandalproof box with loose-key handle and finish as scheduled on Drawings.

2.12 HOSE BIBBS (HB)

- A. General Areas: Provide Chicago Faucet No. 387 chrome plated brass hose bibb with 3/4-inch female inlet, wall flange, tee handle and No. E27 vacuum breaker.
- B. Housekeeping Mop Sinks: Provide Chicago Faucet No. 293-369COLDCP chrome plated brass hose bibb with 3/4-inch female inlet, wall flange and lever handle.

2.13 FLOOR DRAIN TRAP PROTECTION INSERTS

- A. Trap seal protection inserts shall only be installed where job conditions prevent the installation of water supplied trap primers.
 - 1. Trap seal protection insert shall not be installed in drains receiving waste that may have a temperature greater than 140 degrees F.
 - 2. Trap seal protection insert shall not be installed in drains receiving waste discharge flow of greater than 30 gallons per minute.
 - 3. Trap seal protection insert shall not be installed in drains receiving corrosive or chemical waste.
- B. Floor drain trap seal protection insert shall provide watertight seal inside the floor drain and prevent emission of sewer gas and backup of sewage.
- C. Insert material shall be resistant to common cleaning solutions, lime scale and microbiological growth and incorporate a Elastomeric flexible tube that closes when water is not passing through and opens to permit water flow from an intermittent drip. Insert shall provide no restriction on water flow up to 30 gallons per minute.
- D. Insert shall properly functions despite lodging of common debris such as mop strings, food residue, etc.
- E. Trap seal protection insert shall be manufactured by ProSet "Trap Guard", model to suit installation.

2.14 WATER SUPPLIED TRAP PRIMER UNITS (TP)

- A. Trap Priming devices that rely upon line pressure differential for activation are not allowed.
- B. Electronic Trap Primers:
 - 1. Provide model with quantity of outlets and type of mounting box as scheduled on Contract Drawings.
 - 2. The number of traps served by a single trap priming device shall not exceed the number of header outlets provided within the device. Auxiliary distribution units are not allowed.
 - 3. All unused header outlets shall be capped water-tight with compatible threaded fittings.

4. Each electronic trap primer device shall be provided with a readily serviceable strainer immediately upstream of the device solenoid valve.
 5. Electronic trap primers shall provide 10 second water injection to traps every twenty-four hours, complete with galvanized steel box and cover, copper inlet connection, brass ball type stop valve, slow closing 24 VAC solenoid valve with integral strainer, 120-24 VAC transformer, brass atmospheric vacuum breaker, and copper waterway.
 6. Electronic trap primers shall be manufactured by Zurn Z1020-CW or approved equal by Precision Plumbing Products "Prime Time", model to suit installation.
- C. Vacuum Breaker Trap Primer for use with exposed Flushometers:
1. This type of device shall not serve more than one trap.
 2. One Piece, Chrome Plated Flush Connection.
 3. Water Deflector to control the amount of water diverted from the flush.
 4. 3/8" Elbow and Flex-bend Tube connection from Vacuum Breaker to wall.
 5. Diverter Wall Flange and Fittings
 6. Chrome Plated Wall Flange and Fitting to connect 1/2" NPT pipe.
 7. High Back Pressure Vacuum Breaker.
 8. One-piece Bottom Hex Coupling Nut.
 9. Sloan Model VBF-72-A1
- D. Trap Primer for use with Lavatory or Sink Drain Tailpiece:
1. This type of device shall not serve more than one trap.
 2. Polished Chrome Plated Cast Bronze P-trap with Ground Joint Outlet.
 3. Threaded Wall Tube, Slip Joint Nuts, Washers and Escutcheons.
 4. 1/2" Polished Chrome Plated Bronze Primer Tube with Compression Fitting Connection at Wall.
 5. Jay R. Smith Model 2698 or approved equal of a referenced acceptable manufacture.

2.15 STRAINERS

- A. Strainers, 2" and smaller, bronze body, screwed ends, No. 20 mesh type 304 stainless steel screen, screwed cap with bronze blow-off valve (size to be determined by standard tap size in cap).

- B. Strainers, 2-1/2" and larger, Cast iron body, isolating type flanged ends where installed in copper lines, .125" perforated type 304 stainless steel screen, flanged cap with bronze ball blow-off valve (size of blow-off valve shall be determined by standard tap size in cap). Special Note: All strainers 6" and larger shall have studs mounted in the body flange in lieu of bolts for removal of cap. Baskets for strainers 6" and larger shall have stainless steel reinforcing bands at ends to prevent collapsing.

2.16 TEMPERATURE GAUGES:

- A. Thermometers shall be vapor or liquid actuated, direct-mounted, universal adjustable angle dial type with stainless steel or cured polyester powder coated cast aluminum case, stainless steel friction ring and glass window. Dial face shall be white with black figures; pointer shall be friction adjustable type. Movement shall be brass with bronze bushings. Bourdon tube shall be phosphor bronze with a brass socket.
- B. Thermometer range shall be 30 - 240° Fahrenheit and have an accuracy of ± 1 scale division.
- C. Dial face shall be 4 1/2" diameter where installed within eight feet of floor level and 6" diameter where installed higher than six feet above floor level. Provide remote read-out gauges for isolated or hard to access monitoring points.
- D. Provide a brass or stainless steel separable thermowell for each thermometer.
- E. Thermometers shall have a sensing bulb with an insertion length of roughly half of the pipe diameter; minimum insertion length shall be 2". Thermometers installed on tanks shall have a minimum insertion length of 5".
- F. Where insulation thickness exceeds 2", provide proper bulb length and an extension neck separable thermowell. The extension neck shall be at least 2" long.

2.17 PRESSURE GAUGES:

- A. Gauges shall comply with ASME B40.1, Grade 2A, and have ± 0.5 percent of full scale accuracy, with type 304 stainless steel or aluminum case, bronze wetted parts and brass socket. Dial face shall be 3 1/2" diameter where installed within six feet of floor level and 6" diameter where installed higher than eight feet above floor level. Dial face shall be aluminum with white background, black graduations and black markings. Pointer shall be adjustable with black finish. Provide remote read-out gauges for isolated or hard to access monitoring points.
- B. Units of measure shall be in pounds per square inch (psi). The proper range shall be selected so that the average operating pressure falls approximately in the middle of the scale selected.
- C. All pressure gauges shall be equipped with brass or stainless steel needle valves and pressure snubbers.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains with General Contractor.

- B. Verify location of equipment and housekeeping pads prior to installation of floor drains. Relocation due to misplacement shall be at Contractor's expense.

3.02 INSTALLATION

A. General

1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
2. Install plumbing specialties in accordance with manufacturer's published instructions.

B. Drains and Cleanouts

1. Extreme care shall be used to set the top elevation of floor drains and floor sinks to meet the low point elevation of the finished floor.
2. Pipe connections to roof drains, above grade floor drains and floor sinks shall not directly contact or be encased in concrete.
3. Final mounting of interior cleanout top or access cover shall be set flush with the finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil.
4. Encase exterior cleanouts within 14" x 14" x 6" thick reinforced concrete pad. Set top flush with finished grade surface.
5. Locate cleanouts with required clearance for rodding of drainage system.

C. Backflow Preventers and Vacuum Breakers

1. Isolate all non-potable water requirements from the building domestic water system with backflow prevention device manufactured and certified for the particular application.
2. Pipe relief from backflow preventer indirectly to drain of sufficient size to evacuate maximum flow discharge.
3. Backflow preventers shall be duplexed full-size where located within domestic water lines serving in-patient areas, critical research areas, and/or any area or equipment where un-interruptible (24 hour) water service is required.
4. Test ports shall not be located more than 72 inches above finished floor or permanent platform.
5. Do not install vacuum breakers or backflow preventers above equipment, above ceilings, concealed within walls, or areas where water leakage can cause damage.
6. Install a strainer immediately upstream of each vacuum breaker and backflow preventer.

D. Water Hammer Arrestors (Hydraulic Shock Absorbers)-

1. Provide hydraulic shock absorbers in cold and hot water supply lines to each fixture branch, battery of fixtures and at each automatic, solenoid-operated or quick-closing valve serving equipment.

2. Locate and size hydraulic shock absorbers in accordance with PDI-WH-201 Standard and manufacturer's published recommendations.
 3. Install hydraulic shock absorbers with clearances to allow inspection, removal and replacement. Provide access panels where required.
- E. Water Pressure Regulating Valves
1. Provide isolation valve, strainer and pressure gauge immediately upstream of each pressure regulating valve.
 2. Provide pressure gauge and isolation valve immediately downstream of each pressure regulating valve.
 3. Installation shall allow sufficient access to and space around components for adjustments and servicing.
 4. Provide services of a direct factory representative for start-up service, inspection and necessary adjustments for all large demand regulators.

END OF SECTION 22 10 30

SECTION 22 20 23 – NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. This section covers the complete first class natural gas system installation, within and to five (5) feet beyond building perimeter unless noted otherwise on Contract Drawings, including but not limited to piping, regulators, unions, valves, installation, testing and other normal parts that make the systems complete, operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. 2015 Edition of the International Fuel Gas Code.
 - 2. Latest Edition of NFPA 54, National Fuel Gas Code.
 - 3. Minimum Safety Standards for Natural Gas, 49 Code of Federal Regulations (CFR) Part 192, as Required by Title 16 of the Texas Administration Code § 8.70.

1.04 QUALITY ASSURANCE

- A. All materials, equipment and Work shall meet or exceed all applicable federal, state and local requirements and conform to codes and ordinances of authorities having jurisdiction.
- B. Valves: Manufacturer's name, size, standards compliance and pressure rating clearly marked on outside of valve body.
- C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

- E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years documented experience. Installation of natural gas systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. All installation shall be supervised by a licensed Master Plumber. All testing shall be performed by a licensed Journeyman or Master Plumber. Welders shall be certified in accordance with ASME Section 9.

1.05 SUBMITTALS

A. Product Data:

1. Provide code and standards compliance verification, manufacturer's product data and ratings on pipe materials, pipe fittings, regulators, valves and accessories.

B. Record Documents:

1. Submit test reports and inspection certification for all natural gas systems installed under this Contract.
2. Submit manufacturer's data reports for all material used in coating and wrapping.
3. Submit welder's certifications prior to any shop or field fabrication. Welder's certifications shall be current within six (6) months of submission.
4. Record actual locations of valves, regulators, etc. and prepare valve charts.
5. Provide full written description of manufacturer's warranty.

C. Operation and Maintenance Data:

1. Include installation instructions, spare parts lists, exploded assembly views manufacturer's recommended maintenance.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept valves on Site in shipping containers with labeling in place, inspect for damage and store with a minimum of handling. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.07 EXTRA MATERIALS

- A. Refer to Section 01 78 46 for Maintenance Material Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Natural gas pressures shall not exceed five (5) pounds per square inch gauge on customer side of the meter.
- C. Pipe joint compound shall be lead-free, non-toxic, non-hardening, insoluble in the presence of natural gas and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15 degrees F to +400 degrees F, manufactured by Hercules "MegaLoc" or approved equal by Rectorseal, La-Co or Oatey.

2.02 PIPING

A. Buried Piping Outside of Building:

- 1. Polyethylene, SDR-11, ASTM D2513 pipe and fittings with heat fusion socket joints.
- 2. Polyethylene pipe and fitting materials shall be compatible and by same manufacturer to ensure uniform melting and a proper bond. Fabricated fittings shall not be used.
- 3. Provide connection between buried plastic gas service piping and metallic riser in accordance with the gas code. Provide metallic riser consisting of HDPE fused coating on steel pipe for connection to above ground building distribution piping. Underground horizontal metallic portion of riser shall be at least twenty four inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor meeting design pressure rating and plastic pipe manufacturers recommendations shall be used where the plastic joins the metallic riser.

B. Above Ground Piping Outside of Building (Including roof):

- 1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings conforming to ASME B16.3.
- 2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.
- 3. Provide factory-applied, three-layer coating of epoxy, adhesive, and PE or field applied primer and epoxy paint coating on all pipe and fittings. Field applied coating is restricted to fittings and short sections of pipe necessarily stripped for threading or welding. Field coating shall be manufactured by Amercoat Type 240 or approved equal and applied in accordance with manufacturer's recommendations. Galvanizing shall not be considered adequate protection.

C. Above Ground Piping Exposed Inside of Building:

- 1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings conforming to ASME B16.3.

2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.
3. EXCEPTIONS:
 - a. All exposed piping 1½ inches and smaller located within areas utilized as return air plenums shall have welded joints with Schedule 40 socket welded forged steel fittings conforming to ASME B16.11.
 - b. All exposed piping 1½ inches and smaller serving laboratories from main natural gas riser to each emergency shut-off valve shall have welded joints with Schedule 40 socket welded forged steel fittings conforming to ASME B16.11.
- D. Above Ground Piping Concealed Inside of Building (Includes above all ceilings, within partitions, within chases, and all non-accessible locations):
 1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with welded joints with Schedule 40 socket welded forged steel fittings conforming to ASME B16.11.
 2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.
 3. EXCEPTIONS:
 - a. Threaded piping 1½ inches and smaller may be installed in lieu of welded provided that all piping is encased within steel sleeve vented to the exterior of the building. Sleeve piping shall be Schedule 10 black steel pipe conforming to ASTM A53, Grade A or B, electric resistance welded or seamless, with roll-grooved ends. Sleeve pipe couplings shall be Victaulic Style 75 with Grade T nitrile gasket. Sleeve fittings shall be Victaulic grooved malleable or steel. Sleeve piping and fittings must be two pipe sizes, but not less than 1 inch larger than encased gas piping.

2.03 UNDERGROUND WARNING TAPE

- A. Minimum 3 inch wide polyethylene detectable type marking tape. The tape shall be resistant to alkalis, acids and other destructive agents found in soil and impregnated with metal so that it can be readily recognized after burial by standard locating equipment.
 1. Lamination bond of one (1) layer of Minimum 0.35 mils thick aluminum foil between two (2) layers of minimum 4.3 mils thick inert plastic film.
 2. Minimum tensile strength: 63 LBS per 3 IN width.
 3. Minimum elongation: 500 percent.
 4. Provide continuous yellow with black letter printed message repeated every 16 to 36 inches warning of pipe buried below (e.g.: "CAUTION GAS LINE BURIED BELOW").
 5. Manufactured by Reef Industries "Terra Tape" or approved equal.

2.04 VALVES

- A. All valves shall be designed, manufactured and approved for natural gas service.
- B. Line Shut-off Valves sizes 2 inches and smaller shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, wrench operation, rated for 200 WOG service pressure and -20 to 200 degrees F., manufactured by Resun Model R-1430 or Nordstrom Model 142.
- C. Line Shut-off Valves sizes 2½ inches and larger shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with flanged ends, wrench operation, rated for 200 WOG service pressure and -20 to 200 degrees F., manufactured by Resun Model R-1431 or Nordstrom Model 143.
- D. Appliance/Equipment Shut-off Valves at local connections sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL or Milwaukee Model BB2-100.
- E. Manual Emergency Shut-off Valves sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL or Milwaukee Model BB2-100.
- F. Automatic Emergency Shut-off Valves shall be U.L. Listed F.M. Approved for natural gas service, 2-way electrically tripped solenoid type; fail safe closed; manual reset; Type 1 solenoid enclosure; NBR seals and disc; stainless steel core tube and springs; copper coil; manufactured by ASCO Red Hat Series 8044 or approved equal.

2.05 PRESSURE REGULATORS

- A. All pressure regulators shall be designed, manufactured and approved for natural gas service.
- B. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for users. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected user. Regulator shall have a single port with orifice diameter no greater than that recommended by manufacturer for the maximum gas pressure at the regulator inlet. Regulator vent valve shall be of resilient materials designed to withstand flow conditions when pressed against valve port. Regulator shall be capable of limiting build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Commercial grade diaphragm type with internal relief valve, vent valve, cast iron body, Buna-N diaphragm. Manufactured by Rockwell or Fisher.
- C. Install pressure gauge adjacent to and downstream of each line pressure regulator.

2.06 UNIONS

- A. Unions in 2 inches and smaller in ferrous lines shall be right and left hand nipple/coupling assembly, or ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends, 2-1/2 inches and larger shall be ground flange unions. Companion flanges on lines at various items of equipment, machines and pieces of apparatus may serve as unions to permit disconnection of piping.
- B. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.
- C. Above grade flexible stainless steel appliance/equipment connectors shall conform with AGA under the ANSI Z21.69 Standard. Hose shall be braided stainless steel with a polyolefin heat-shrink tubing with high flame-retardant qualities. Hose shall be equipped with malleable iron unions and spring loaded brass quick-link couplings. An easily accessible manual shut-off valve shall be installed ahead of all hose connections. Specify T&S Brass "Safe-T-Link" or approved equal.

2.07 FLANGES

- A. All 150 lb. and 300 lb. ANSI flanges shall be domestically manufactured, weld neck forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71. Slip on flanges shall not be used. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer's trademark permanently identified in accordance with MSS SP-25. Contractor shall submit data for firm certifying compliance with these Specifications. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. All thread rods will not be an acceptable for flange bolts. Bolts shall have a tensile strength of 60,000 psi and an elastic limit of 30,000 psi. Flat-faced flanges shall be required to match flanges on pumps, check valves, strainers, etc. Only one manufacturer of weld flanges will be approved for each project.
- B. All flanges shall be gasketed. Contractor shall place gasket between flanges of flanged joints. Gaskets shall fit within the bolt circle on raised face flanges and shall be full face on flat face flanges. Gaskets shall be cut from 1/16 inch thick, non metallic, non asbestos gasket material suitable for operating temperatures from -150 degrees F to +75 degrees F, Klingersil C-4400, Manville Style 60 service sheet packing, or approved equal.

2.08 LABORATORY NATURAL GAS PIPING

- A. All natural gas piping serving labs from main natural gas riser shall be routed exposed to view below ceiling and painted in accordance with Division 09.
- B. Install emergency gas shut-off valve in each line serving individual laboratory rooms. Locate shut-off actuator within lab area adjacent to each room exit at 54 inches above finished floor. Location of emergency shut-off shall be accessible to occupants for shutting off the natural gas supply under emergency conditions and comply with Texas Accessibility Standards Accessible Elements and Space requirements.

- C. Gas piping joints shall be welded from main natural gas riser to each emergency shut-off valve. Piping from the emergency shutoff valve to the outlets shall be assembled with threaded fittings provided all joints are exposed to view or within the confines of laboratory furniture.
- D. Install flexible stainless steel appliance/equipment connector at each fume hood and biological safety cabinet requiring natural gas service. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe ends and remove cutting burrs. Bevel plain end ferrous pipe.
- B. Remove cutting oil, scale and dirt, on inside and outside of piping, before assembly.

3.02 EQUIPMENT CONNECTIONS

- A. Provide specified connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.
- B. Provide and install union type connections at all equipment to permit removal of service piping.
- C. Gas service connections shall have a diameter at least one pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.
- D. Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.
- E. Rigid metallic pipe and fittings shall be used at service connections to all stationary equipment.

3.03 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Provide support for and connections to natural gas service meter in accordance with requirements of the utility company.

- D. All installation shall be in accordance with manufacturer's published recommendations.
- E. Distribution piping shall be as short and as direct as practicable between the point of delivery and the outlets.
- F. All excavation required for plumbing work is the responsibility of the Plumbing Contractor and shall be done in accordance with project Specifications.
- G. Do not install underground piping when bedding is wet or frozen.
- H. Bury all underground piping at least 3 feet below finished grade. Provide a continuous detectable warning tape on tamped backfill, 12 inches above all buried non-metallic gas lines.
- I. Do not install gas piping in the same trench with other utilities. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be 2 feet. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.
- J. Install and support all polyethylene piping in accordance with manufacturer's recommendations. All heat fusion welds shall be performed by welders qualified to the manufacturer's procedures.
- K. Polyethylene piping shall not be installed above ground.
- L. Provide connection between buried plastic gas piping and metallic riser in accordance with the gas code.
- M. All above ground gas piping shall be electrically continuous and bonded to electrical system ground conductor in accordance with NFPA 70.
- N. Provide and install union type fittings at proper points to permit dismantling or removal of pipe. No unions will be required in welded lines except at equipment connections. Where union type fittings are necessary for piping dismantling purposes, right and left nipples and couplings shall be used. Flanges, ground-joint unions or approved flexible appliance connectors may be used at exposed fixture, appliance or equipment connections.
- O. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric coupling or dielectric flange fitting.
- P. Valves, regulators, flanges, union type fittings and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings, within chases, walls/partitions, spaces utilized as return air plenums or non-accessible locations.
- Q. Route piping in orderly manner and maintain gradient. Install piping to conserve building space. Group piping whenever practical at common elevations.
- R. Install piping to allow for expansion and Contraction without stressing pipe, joints, or connected equipment.
- S. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main no lower than the horizontal midpoint of the gas main.
- T. Close nipples, bushing and cross type fittings shall not be installed in any gas piping system.

- U. Slope piping and arrange to drain at low points. Install drip/sediment traps at points where condensate and debris may collect. Locate drip/sediment traps where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing. Construct drip/sediment traps using tee fitting with capped nipple connected to bottom outlet. Use minimum-length nipple of 3 pipe diameters, but not less than 4 inches long, and same size as connected pipe. Cap shall be screwed pattern, black, standard weight, malleable iron. Install with adequate space for removal of cap.
- V. Install valves for shut off and to isolate equipment, parts of systems, or vertical risers. All valves shall be located such that servicing and operation is possible. All flanged valves shown in horizontal lines with the valve stem shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance. Valves shall be installed as nearly as possible to the locations indicated in the Contract Drawings. Any change in valve location must be so indicated on the Record Drawings.
- W. Install line shut-off valve at each branch connection to riser. Branch line shut-off valves shall be automatic type where indicated on Drawings.
- X. Provide adequate clearance for access to and operation of all valves.
- Y. Install valves with stems upright or horizontal, not inverted unless required otherwise by the valve manufacturer.
- Z. Pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum three (3) feet above or twenty five (25) feet horizontally from all air intakes or building openings.
- AA. Above ground horizontal natural gas and encasement piping shall be supported at intervals of no greater than 6 foot for 1/2 inch piping, 8 foot for 3/4 inch and 1 inch piping and 10 foot for 1-1/4 inches and larger piping. Vertical piping shall be supported at each floor level and at intervals as specified for horizontal piping.
- BB. Extension bars shall not be used for supporting gas or encasement piping. Gas or encasement piping shall not be used to support any other piping or component.
- CC. Identify piping and valves in accordance with Project Specification Section 20 05 53.

3.04 INSTALLATION OF WELDED PIPING

- A. Welding of pipe in normally occupied buildings is prohibited. Off-Site welding is acceptable. Should welding be required in a normally occupied building for connecting to an existing welded system, obtain written approval from the Resident Construction Manager and comply with Owner's fire and life safety requirements.
- B. Piping and fittings shall be welded and fabricated in accordance with ASME/ANSI the latest editions of Standard B32.1 for all systems from the Code for Pressure Piping. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.

- C. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Maintain inside of fittings free from globules of weld metal. All welded pipe joints shall be made by the fusion welding process, employing a metallic arc or gas welding process. All pipes shall have the ends beveled 37-½ inch degrees and all joints shall be aligned true before welding. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size and the like shall be made with factory-fabricated welding fittings. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.
- D. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.
- E. Contractor shall not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welded during welding operation.
- F. Do not split, bend, flatten or otherwise damage piping before, during or after installation.
- G. Remove dirt, scale and other foreign matter from the inside of piping, by swabbing or flushing, prior to the connection of other piping sections, fittings, valves or equipment.
- H. In no cases shall Schedule 40 pipe be welded with less than three passes including one stringer/root, one filler and one lacer. Schedule 80 pipe shall be welded with not less than four passes including one stringer/root, two filler and one lacer. In all cases, however, the weld must be filled before the cap weld is added.

I. Weld Testing:

- 1. All welds are subject to inspection, visual and/or x-ray, for compliance with Specifications. The Owner will at the Owner's option, provide employees or employ a testing laboratory for the purposes of performing said inspections and/or x-ray testing. Initial visual and x-ray inspections will be provided by the Owner. The Contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and retesting of any welds found to be unacceptable. In addition, the Contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1 and B31.3 due to the discovery of poor, unacceptable or rejected welds.
- 2. Welds lacking penetration, containing excessive porosity or cracks, or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the Code, current edition.

3.05 TESTING

- A. All natural gas systems shall be inspected, tested, purged and placed into operation in accordance with NFPA 54 and as required herein.
- B. All natural gas piping systems shall be very carefully inspected, tested, purged and placed into operation by a Licensed Plumber. All pneumatic tests shall be witnessed, recorded and countersigned by the owner representative.

- C. All necessary apparatus for conducting tests shall be furnished by the Contractor and comply with the requirements of NFPA 54.
- D. All new rough-in distribution piping and affected portions of existing systems connected to, shall be subjected to a pneumatic test pressure utilizing clean, dry air and must be demonstrated to be absolutely tight when subjected to the pressures and time durations listed herein. All equipment and components designed for operating pressures of less than the test pressure shall not be connected to the piping system during test.
 - 1. Systems on which the normal operating pressure is less than 0.5 pounds per square inch gauge (psig), the test pressure shall be 5.0 psig and the time interval shall be 30 minutes.
 - 2. Systems on which the normal operating pressure is between 0.5 psig and 5.0 psig, the test pressure shall be 1.5 times the normal operating pressure or 5.0 psig, whichever is greater, and the time interval shall be 30 minutes.
 - 3. Systems on which the normal operating pressure is 5.0 psig or greater, the test pressure shall be 1.5 times the normal operating pressure, and the time interval shall be one (1) hour.
- E. After testing is complete, the entire gas system shall be purged with dry nitrogen to eliminate all air, debris and moisture from the piping before natural gas is introduced into the system.
- F. After successful results of pressure test and purging have been completed, a leakage test shall be performed in accordance with NFPA 54 Appendix D.
- G. Connect, inspect and purge gas utilization equipment, lab hook-ups, outlets, etc., and place into operation only after successful results of pressure test, leakage test and purging have been completed and accepted.
- H. In all instances in which leaks are then found, they shall be eliminated in the manner designated by the Owner's duly authorized representative. Testing operations shall be repeated until gas-piping systems are absolutely tight at the pneumatic test pressures indicated above.
- I. The Contractor shall make all arrangements to assure that owner representative view the final test and that a certificate is provided from the Inspectors verifying that the installation meets requirements.
- J. Pressure test gas piping sleeve system with clean, dry compressed air at 15 psig by temporarily sealing all openings between gas carrier pipe and sleeve and vent openings. Sleeve systems must be demonstrated to be absolutely tight when subjected to this pressure for a period of four hours.

END OF SECTION 22 20 23

SECTION 22 33 33 – ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. This section covers providing all labor and materials for the complete first class installation of point-of-use electric storage (6 - 50 gallon) tank type domestic water heaters indicated and scheduled on Contract Drawings complete with all controls, piping, valves, wiring, supports, accessories, testing, and other normal parts required for complete, code compliant, operable installation that is acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. 2015 Edition of the International Plumbing Code
 - 2. Underwriters Laboratories Listings
 - 3. 2014 Edition of the National Electric Code

1.04 QUALITY ASSURANCE

- A. Heaters shall be designed to limit the maximum temperature to avoid scalding.
- B. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.
- C. Provide equipment with manufacturer's name, model number, and rating/capacity permanently identified.
- D. Water heater shall meet or exceed the minimum energy factor requirements of ASHRAE Standard 90.1.

- E. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the Work of this section. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.
- F. Products and installation of specified products shall be in conformance with recommendations and requirements of the following:
 - 1. National Sanitation Foundation (NSF).
 - 2. National Electric Code (NFPA 70).
 - 3. UL Standard 1453 or UL Standard 174 - Electric Booster and Commercial Storage Tank Water Heaters.

1.05 SUBMITTALS

A. Product Data:

- 1. Include dimension Drawings of water heaters indicating piping, components and required connections.
- 2. Manufacturer's data sheets, wiring diagrams and Installation Instructions.
- 3. Provide complete description of equipment materials, electrical characteristics, options provided, warranty, maximum water pressure requirements and code compliance.

B. Record Documents:

- 1. Provide full written description of manufacturer's warranty.

C. Operation and Maintenance Data:

- 1. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept products on Site in factory packaging. Inspect for damage. Maintain products in factory packaging until installation.
- B. Provide temporary inlet and outlet caps when not factory provided. Maintain caps in place until installation.
- C. Protect components from damage after installation.
- D. Do not allow use of heater for any reason, other than testing, during the construction phase of this project.

1.07 WARRANTY

- A. The manufacturer shall provide a three-year warranty in writing against tank leaks caused by corrosion and one-year parts warranty against operational failure due to faulty manufacturing or materials.
- B. The complete system shall be warranted in writing against defects in materials or workmanship under normal use and service for a period of one year after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 POINT OF USE DOMESTIC WATER HEATER

- A. Acceptable manufacturers
 - 1. State
 - 2. Rheem
 - 3. A.O. Smith
 - 4. All electric point-of-use storage tank type water heaters provided within this project shall be the product of one manufacturer.
- B. Furnish and domestic hot water heaters with dimensions, capacities and electrical characteristics as scheduled on the Contract Drawings and as outlined herein. This Specification describes minimum quality and performance requirements. Variations of system components by the individual referenced manufacturers are acceptable for installation in this project provided they meet or exceed all of the requirements indicated herein, are compatible with the electrical service provided and fit properly in the allocated space.
- C. Heater shall have 150 psi working pressure and be equipped with extruded high density anode rod. All internal surfaces of the heater exposed to water shall be glass-lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1600°F.
- D. Direct-Immersion threaded electric heating elements heating elements shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch. Heaters having double-elements shall be provided with simultaneous wiring to permit both elements to operate at the same time.
- E. The heater outer jacket shall be of baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panels and shall enclose the tank with foam insulation.

- F. Water heater shall have a properly sized, factory provided temperature and pressure relief valve.
- G. The tank drain valve shall be located in the front for ease of servicing.

2.03 VACUUM RELIEF VALVES

- A. Construction shall be bronze body with silicone disc having a dry guide which is located out of the water. Unit shall open at less than 1/2" vacuum and be suitable for use within a system having a maximum water pressure of 200 psi and a maximum temperature of 250°F. Vacuum relief valves shall be in compliance with the appropriate requirements of ANSI Z21.22.
- B. Vacuum relief valves shall be manufactured by Watts Regulator, Wilkins or Conbraco.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Provide 4" high reinforced concrete housekeeping pad beneath floor mounted water heaters or provide heater with legs/base manufactured by heater manufacturer.

3.02 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Install water heaters, piping, wiring and accessories in accordance with the manufacturer's installation instructions.
- D. Furnish all supports required by the equipment included in this Contract in accordance with the manufacturer's published instructions.
- E. Each water heater located above ceiling or at any location where leakage would result in damage to the building or its contents shall be provided with and set within a safety pan equipped with a minimum 3/4 inch drain connection. Safety pans shall be minimum 24 gauge galvanized sheet metal and be three inches larger on all sides than the water heater, with a minimum depth of two inches.
- F. Connect and extend copper piping from pan drain connection and temperature and pressure relief valve and discharge separately to the exterior of the building and terminate between 6 and 24 inches above grade at a visible location that cannot cause damage to property or personnel. Relief valve shall not discharge into safety pan.
- G. Safety pan and relief valve drain lines shall be copper and installed so that all water will drain completely out of the piping. Where it is impractical or physically impossible to extend a drain line to the building exterior, drain lines shall discharge separately into a floor drain, housekeeping mop sink or other location approved by the building inspector.
- H. Each water heater shall be provided with clear access and unobstructed passageway that is adequate to allow removal and replacement.

- I. Install heater in a vertical position with a clearance on all sides for servicing. Coordinate location of unit to avoid conflicts with other system or building components.
- J. Furnish and install all necessary valves, strainers, unions, etc. to facilitate proper functioning and servicing of equipment.
- K. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment.
- L. Install an accessible line size shutoff valve in cold water inlet within two feet of heater.
- M. Provide heat trap inlet piping for storage type heaters to prevention migration of heated water into cold water system.
- N. Provide heat trap in outlet piping for storage type heaters serving non-circulated distribution systems.
- O. Provide a vacuum relief valve in cold water supply to heaters having bottom feed inlet. Install valve in accordance with manufacturer's recommendations.
- P. Provide a temperature gauge in the outlet piping adjacent to storage type heaters. Locate gauge in an easily readable position.
- Q. Flush water supply line to remove all air, scale and dirt prior to connecting heater.
- R. Take precautions to prevent heat generated by soldering procedures from being transmitted to heater components.
- S. Coordinate with Electrical Contractor for power and wiring required. Verify that electrical power is connected to a properly grounded dedicated branch circuit of proper voltage rating and equipped with ground fault interrupter. Each heater shall be provided with an independent circuit. Insure that the correct wire and circuit breaker sizes are provided.
- T. When all plumbing installation is completed, check for leaks and take corrective action before proceeding. Flow hot water until temperature has stabilized. Verify and insure that the water meets scheduled temperature at all outlets. Clean heater water prior to final inspection of installation.

3.03 TRAINING

- A. Contractor shall instruct and acquaint the Owner with the proper functioning, operation and maintenance of the water heater and all associated installed components.

END OF SECTION 22 33 33

SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. This section includes the furnishing of all labor and materials necessary for a complete installation of all plumbing fixtures indicated on the Drawings and specified herein.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. 2015 Edition of the International Plumbing Code
 - 2. 2012 Uniform Plumbing Code with (COH Amendments)
 - 3. Texas Department of Licensing and Regulation, Texas Accessibility Standards of the Architectural Barriers Act, Article 9102, Texas Civil Statutes
 - 4. Americans with Disabilities Act, 28 CFR Part 35 Nondiscrimination on the Basis of Disability in State and Local Government Services, Final Rule, as published in the Federal Register
 - 5. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities" relative to plumbing fixtures for people with disabilities
 - 6. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water
 - 7. Texas Health and Safety Code, Chapter 372, Environmental Performance Standards for Plumbing Fixtures
 - 8. ANSI/ASME A112, Plumbing Standards

1.04 PRODUCTS NOT FURNISHED BUT INSTALLED UNDER THIS SECTION

- A. Rough-in for and make final connection to Owner furnished fixtures and equipment requiring plumbing services.
- B. Rough-in for and make final connection to fixtures and equipment furnished under other divisions of these Contract Specifications requiring plumbing services.

1.05 QUALITY ASSURANCE

- A. Fixtures, trim, accessories and carriers of any one type shall be by the same manufacturer throughout.
- B. All fixtures and trim shall be new, institutional/commercial quality and free from mars, chips, scratches, blemishes or any defects.

1.06 SUBMITTALS

- A. Product Data:
 - 1. Provide manufacturer's data sheets indicating Code and Standards compliance, illustrations of fixtures, physical sizes, rough-in dimensions, utility sizes, trim and finishes.
- B. Record Documents:
 - 1. Provide full written description of manufacturer's warranty.
 - 2. Manufacturer's installation instructions.
- C. Operation and Maintenance Data:
 - 1. Include installation instructions, exploded assembly views, servicing requirements, inspection data, installation instructions, spare parts lists, replacement part numbers and availability, location and contact numbers of service depot, for all plumbing specialties installed.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Accept fixtures on Site in factory packaging. Inspect for damage.
- B. Protect all fixtures and trim before and after installation from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for installation within exterior environments.
- C. Protect installed fixtures and trim from damage and/or entry of foreign materials by temporary covers during the construction phase of this project.
- D. Do not allow use of installed fixtures and trim for any reason, other than testing, during the construction phase of this project.

1.08 EXTRA MATERIALS

- A. Refer to Section 01 78 46 for Maintenance Material Requirements.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are either as indicated on Shop Drawings or as instructed by the manufacturer. Designate within submittals that measurements have been verified, and note which measurements are the basis for construction.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- | | |
|---|--|
| A. Stainless Steel Sinks: | Just, Elkay |
| B. Mop Sinks: | Crane/Fiat, Stern Williams |
| C. Drinking Fountains: | Oasis, Sunroc, Elkay, Halsey Taylor,
Murdock |
| D. Bariatric Toilets: | Acorn, Whitehall, Willoughby |
| E. Vitreous China Water Closets: | American Standard, Kohler, Crane, Eljer |
| F. Vitreous China Clinical Flushing Rim Sinks: | American Standard, Kohler, Crane, Eljer |
| G. Vitreous China Urinals: | American Standard, Kohler, Crane, Eljer |
| H. Vitreous China Lavatories: | American Standard, Kohler, Crane, Eljer |
| I. Cast Iron Bathtubs: | American Standard, Kohler, Crane, Eljer |
| J. Manual Lavatory/Sink Faucets: | Chicago |
| K. Manual Laboratory Sink Faucets: | Chicago, WaterSaver |
| L. Electronic Lavatory/Sink Faucets (DC Powered): | Chicago "HyTronic" |
| M. Electronic Lavatory/Sink Faucets (AC Powered): | Chicago "HyTronic" |
| N. Manual Flush Valves: | Sloan "Royal" or Zurn "AquaVantage" |
| O. Manual Flush Valves with Bedpan Washer: | Sloan "Royal" or Zurn "AquaVantage" |
| P. Electronic Flush Valves (DC Powered): | TOTO "EcoPower", Sloan "Optima",
Zurn "AquaSense" |
| Q. Electronic Flush Valves (AC Powered): | Sloan "Optima" or Zurn "AquaSense" |
| R. Shower/Bathtub Mixing Valves:
"Hydroguard" | Chicago "Tempshield", Powers |
| S. Shower Heads/Hand Sprayer: | Chicago, Powers, Leonard, Speakman |
| T. Bedpan Washers (Hand held): | Chicago |
| U. Fixture Stops & Supplies: | Chicago |

- V. Fixture Traps: Chicago, McGuire
- W. Toilet Seats: Church, Bemis, Olsonite
- X. Fixture Carriers: Wade, Josam, Zurn, Smith
- Y. A.D.A. Insulation Kits: McGuire, Truebro, Plumberex

2.02 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Provide plumbing fixtures as indicated and scheduled on the Contract Drawings and as specified herein.
- C. Fixtures, trim and accessories of any one type shall be by the same manufacturer.
- D. All vitreous china fixtures shall be white in color unless noted otherwise on Drawings.
- E. All plumbing fixture trim within public toilet rooms shall be furnished with vandal-proof trim.
- F. All exposed brass fixture trim shall be heavily chrome plated.
- G. Fittings and piping shall be brass and, wherever exposed, shall be polished chrome-plated. Provide tight fitting wall or floor escutcheons of chrome-plated brass or stainless steel wherever pipes pass through floors, walls or ceilings.
- H. Fixture supplies shall be loose key angle stops with 1/2" I.P.S. female inlets and shall include wall flanges and brass risers. All components shall be chrome plated. In all cases, all piping, tubing, fittings and faucets shall be installed using mechanical non-slip connections, such as bull-nose, flanged, ferrule or threaded fittings. Fittings requiring a friction fit using slip-on or gasket connections are not acceptable. [EXCEPTION: Hose type riser supplies are acceptable when supplied and required by the fixture manufacturer]. Supply riser tubing for lavatories and sinks shall be minimum 3/8" O.D.
- I. Provide A.D.A. compliant molded insulation on exposed water and drain piping beneath handicap accessible lavatories and sinks. Insulation shall be designed to allow removal and re-installation for pipe servicing.
- J. Unless noted otherwise, install each lavatory, sink and drinking fountain with chrome-plated, 17 gauge trap with cleanout plug that is easily removable for servicing and cleaning. Slip joints shall be permitted only on the fixture trap inlet, within the trap seal and at outlet connection to the trap adapter.
- K. Wall mounted water closets, lavatories, urinals and drinking fountains shall be supported with commercial carriers bolted to floor, model to suit installation. Provide concealed arm type carriers for lavatories.
- L. Fixtures shall have flow control devices to limit the flow of water to a maximum rate in accordance with the following table:

FIXTURE	MAXIMUM WATER USAGE
Patient Shower Valve or Head	2.5 GPM (at 80 psi)

Non-Patient Shower Valve or Head	2.0 GPM (at 80 psi)
Staff Lavatory Faucet	2.2 GPM (at 60 psi)
Public Toilet Room Lavatory Faucet	0.5 GPM (at 60 psi)
Sink Faucet	2.2 GPM (at 60 psi)
Water Closet	1.28 Gallons Per Flush
Urinal	0.25 Gallon Per Flush

M. Stainless Steel Sinks

1. Stainless steel sinks shall be 18 gauge, Type 304 stainless steel with insulation undercoating.
2. Provide stainless steel covers for all unused sink faucet/accessory holes. Covers shall be secured with stainless steel bolt and wing nut. Snap-in type covers are not acceptable. Covers shall provide a watertight seal by utilizing rubber gasket or plumbers putty.
3. Sink strainer shall be 316 stainless steel.

N. Housekeeping Mop Sinks

1. Provide mop sink having dimensions as scheduled on Contract Drawings
2. Receptor shall be precast terrazzo composed of marble chips and Portland cement, ground smooth, grouted and sealed to resist stains.
3. Stainless steel caps shall be cast integral on all curbs.
4. Shoulders shall not be less than 9-3/4" high inside (12" high outside) measurement, and not less than 1-1/4" wide. Drop front shoulders shall have 6" high outside measurement.
5. Tiling flanges shall be cast integral and extend 1" above shoulder on 1, 2 or 3 sides (as required per Project).
6. Drain shall be cast brass with stainless steel strainer cast integral and shall provide for a code compliant connection to a 3" pipe.

O. Bariatric Toilets

1. Unit shall conform to ADA requirements and withstand loads up to 2,000 pounds with no measurable deflection and loads up to 5,000 pounds with no permanent damage.
2. Fixture shall be floor mounted fabricated from 14 gage, type 304 stainless steel with side access panels. Construction shall be seamless welded construction and white epoxy anti-microbial finish.
3. Toilet shall be ASME A112.19.3 and CSA B45.4 compliant. Toilet shall evacuated bowl contents with a minimum water consumption of 1.28 gallons per flush. Toilet trap shall be fully enclosed and have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball.
4. Toilet shall have a floor mounted elongated bowl with a self-draining flushing rim and top spud.
5. Provide unit having wall or floor waste outlet as required.

6. Provide hinged open-front seat (less cover) rated for minimum 1,200 pounds.
7. Provide in-patient room toilets with bedpan lugs.

P. Water Closets

1. Water closets shall be vitreous china, wall-mounted elongated bowl having siphon jet flushing action design.
2. Water closet bowls installed within non-ambulatory patient toilet rooms shall be furnished with slotted rim for bedpan holding.
3. Water closet bowl gaskets shall be neoprene, felt gaskets and wax rings are not permitted.
4. Wall mounted water closets shall be supported with extra-heavy duty commercial carriers bolted to floor and rated for a 500 pound load. Carrier model shall be designed for the actual fixture being supported and provided with all options and accessories manufactured by the carrier manufacturer for a complete installation. Provide auxiliary foot support as recommended by the manufacture to prevent bending of fixture support stud bolts.
5. Water closet seats shall be commercial/institutional grade, white in color, have open front and stainless steel self-sustaining check hinges.

Q. Flush Valves

1. Water closet and urinal flush valves shall be chrome plated brass exposed type.
2. Urinal flush valves shall be electronic sensor operated.
3. All electronic flush valves shall be provided with manual override activators. EXCEPTION: Flush valves located within specimen collecting toilet rooms shall be hard-wired without manual override activator.
4. AC powered electronic flush valves located within Patient Care areas and critical Research areas shall be connected to the emergency electrical system.
5. Flush valves in non-ambulatory patient toilet rooms shall be manually operated and have integral bedpan washer.

R. Faucets

1. Provide faucets with laminar flow outlets. Aerators shall not be acceptable. Faucet flow control devices shall be located at the spout outlet.
2. Provide vacuum breakers for all faucets that have threaded or serrated hose connection outlets (including laboratory pure water faucets).
3. Gooseneck spout outlets shall terminate five inches minimum and six & one half inches maximum above top rim of lavatory or sink. Horizontal dimension from spout inlet to spout outlet shall be a minimum five & one half inches.
4. Provide integral hot and cold water inlet check stops in all mixing type sink faucets that have hose connection outlets.

5. All non-public use electronic faucets shall be designed and manufactured to allow continuous water flow during usage for at least sixty seconds after initial activation.
 6. All electronic lavatory faucets located within public toilet rooms shall be designed and manufactured to allow continuous water flow during usage for a maximum duration of ten seconds after initial activation.
 7. AC powered electronic faucets located within Patient Care areas and critical Research areas shall be connected to the emergency electrical system.
 8. All lavatory faucets within non-patient room toilets shall have low-profile (non-gooseneck) spouts and electronic sensor activation.
 9. Lavatory faucets within patient rooms shall have gooseneck spouts and manually activated four-inch wrist blade operation.
 10. Staff Lavatory Faucets:
 - a. Chicago – HyTronic Traditional with internal temperature control mixer, 2.2 GPM flow outlet, Model 116.211.AB.1 for DC power, and Model 116.111.AB.1 for AC power.
 11. Public Toilet Room Lavatory Faucets
 - a. Chicago – HyTronic Traditional with internal temperature control mixer, .05 GPM flow outlet, Model 116.211.AB.1 for DC power and Model 116.111.AB.1 for AC power.
- S. Shower and Bathtub Mixing Valves
1. Shower and bathtub mixing valves shall be ASME A112.18.1M, CSA B125, ASSE 1016 and ADA compliant, having combination thermostatic/pressure balancing replaceable cartridge, integral check valves, integral stops and high temperature limit set at 110° F.
 2. Thermostatic/pressure balance mixing valves shall have brass body construction with polished chrome plated finish, lever control handles for volume and temperature, and 1/2" NPT connections.
 3. Provide showerheads, tub spouts, hand-held shower systems, diverters, vacuum breakers and other trim accessories as scheduled on Contract Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories, sinks, faucets and related trim and accessories.
- C. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes required by code, as recommended by the manufacturer, and as indicated in Contract Drawings fixture rough-in schedule.

3.03 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Furnish and install all labor, materials, equipment, tools and services and perform all operations required in connection with or properly incidental to the installation of complete plumbing fixtures, as indicated on Contract Drawings, reasonably implied therein or as specified herein, unless specifically excluded.
- D. Each piece of trim shall be furnished whether specifically mentioned or not, in order to provide a complete first-class installation. Furnish and install all required water, waste, soil and vent connections to all plumbing fixtures, together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order.
- E. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.
- F. Coordinate mounting heights of plumbing fixtures with architectural details/elevations.
- G. Install A.D.A. compliant water closet flush valve handles on wide side of toilet stalls.
- H. Install fixtures and trim in accordance with manufacturer's instructions.
- I. All exposed chrome plated, polished or enameled fixtures and trim shall be installed with special care, leaving no tool marks on finishes. Install flexible brass fixture supply risers using manufactured tube bending tools. Bending tubes only with the use of hands shall not be permitted.
- J. Install each fixture trap, easily removable for servicing and cleaning.
- K. Provide chrome-plated deep escutcheons where required to cover non-chrome-plated piping projecting through walls.
- L. Thoroughly fill spaces between fixtures and walls, countertops and/or floors with waterproof, mold resistant, non-toxic, non-shrinkable white tile caulking.
- M. Install components firmly fixed, level and plumb.
- N. Install and secure all wall mounted fixtures in place with commercial carriers and bolts in accordance with manufacturer's instructions. Fixture weight shall not be transmitted to walls, partitions or service piping. Installation shall prevent any movement of fixture during use.

- O. All non-monolithic shower floors shall be provided with drain pan attached to floor drain flange in accordance with the latest edition of the Uniform Plumbing Code. Refer to Architectural Contract Specifications and Drawings for pan materials and additional installation requirements.

3.04 INTERFACE WITH OTHER PRODUCTS AND TRADES

- A. Review millwork Shop Drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Provide templates for all fixtures to be mounted in millwork to General Contractor.
- C. Coordinate with Electrical Contractor and insure proper power is provided for electric drinking fountains, sensor operated faucets and sensor operated flush valves

3.05 TESTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.
- B. Adjust and set sensor faucet mixing valves to provide desired water temperature at spout outlet.
- C. Insure that all traps are filled with water and maintain trap seal. Each fixture shall be filled and then drained. Traps and fixture connections shall be proven water tight by visual inspection.
- D. After fixtures have been installed and water systems are pressurized, test each fixture and associated trim for proper operation and inspect for leaks. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all components operate properly.
- E. Test drain pans installed for non-monolithic shower floors prior to installation of finished flooring. Fill pan with water to within 1" of top. Pan must maintain test water level without leakage for at least eight hours

3.06 CLEANING

- A. Thoroughly clean all plumbing fixtures and equipment furnished under this Contract prior to final acceptance.
- B. Thoroughly flush and clean all faucet spout outlet screens and flow control devices.

3.07 PROTECTION OF FINISHED WORK

- A. Do not permit use of fixtures until after Substantial Completion has been announced by Owner.

END OF SECTION 22 40 00

SECTION 23 00 00

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 23 sections, in addition to Division 01 - General Requirements.

1.2 RELATED DOCUMENTS

- A. Basic and supplemental requirements common to HVAC.
- B. THE UNIFORM GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, and Division 01 of the specifications apply to the work specified in this section.
- C. All work covered by this section of these specifications shall be accomplished in accordance with all applicable provisions of the Contract Documents and any addenda or directives which may be issued herewith, or otherwise.

1.3 GENERAL

- A. The Contractor shall execute all work herein after 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
- B. 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
- C. The Mechanical drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every pipe 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, above suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Or where no ceilings exist. All exposed work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted. All work shall be NFPA compliant and compliant with Insurance Underwriter requirements and guidelines.
- D. When the Mechanical drawings do not give exact details as to the elevation of pipe and ductwork, 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 is generally intended to be installed true and square to the building construction, The drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas, unless there is no ceiling.

1.4 DEFINITIONS

- A. These definitions are included to clarify the direction and intention of these Specifications. The list given here is not by any means complete. For further clarification as required, contractor shall contact the designated Owner's representative.
1. Concealed / Exposed: Concealed areas are those that cannot be seen by the building occupants. Exposed areas are all areas that are exposed to view by the building occupants, including under counters, inside cabinets and closets, plus all mechanical rooms.
 2. General Requirements: The provisions of requirements of other Division 01 sections apply to entire work of contract and, where so indicated, to other elements that are included in project. Basic contract definitions are included in the General Conditions.
 3. Indicated: The term "indicated" is a cross reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements on contract documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping reader locate the cross reference, and no limitation of location is intended except as specifically noted.
 4. Directed, requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect/Engineer," "requested by Architect/Engineer" and similar phrases. However, no such implied meaning will be interpreted to extend Architect's/Engineer's responsibility into Contractor's area of construction supervision and job safety.
 5. Approve: Where used in conjunction with Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations to Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents or to extend Architect's/Engineer's responsibility into Contractor's area of construction supervision and job safety.
 6. As required: Where "as required" is used in these specifications or on the drawings, it shall mean "that situations exist that are not necessarily described in detail or indicated that may cause the contractor certain complications in performing the work described or indicated. These complications entail the normal coordination activities expected of the Contractor where multiple trades are involved and new or existing construction causes deviations to otherwise simplistic approaches to the work to be performed. The term shall not be interpreted to permit an option on the part of the Contractor to achieve the end result."
 7. Furnish: The term "furnish" is used to mean "supply and deliver to project site, ready for unloading, unpacking, assemble, installation, and similar operations. Where "furnish" applies to work for which the installation is not otherwise specified, "furnish" in such case shall mean "furnish and install."
 8. Install: The term "install" is used to describe operations at Project Site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 9. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use.

1.05 PERMITS, UTILITY CONNECTIONS AND INSPECTIONS

- A. General: Refer to Division 01 for construction phasing and time increments.
- B. Fees and Costs: If, during the course of the construction, a need arises to buy utilities, the Contractor shall pay all fees attendant thereto. If city or privately owned utility piping or electrical cable needs to be extended, relocated, or terminated, the Contractor will pay all permits and construction/inspection fees associated with that particular work.
- C. All work performed on this project is under the authority of the State of Texas, therefore no local construction fees or construction permits will be required except as may be required for new service taps, or new or modified connections to city controlled services. If inspections by city personnel are specifically required by this document, then the Contractor is responsible for any fees or permits in connection to those requirements.
- D. Compliance: The Contractor shall comply in every respect with all requirements of National Fire Protection Association, and utility company requirements. In no case does this relieve the Contractor of the responsibility of complying with these specifications and drawings where specified conditions are of higher quality than the requirements of the above-specified authorities. Where requirements of the specifications and drawings are more lenient than the requirements of the above authorities having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above authorities with no extra compensation.

1.6 CONTRACT DRAWINGS

- A. All dimensional information related to new structures shall be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.
- B. The interrelation of the specifications, the drawings, and the schedules are as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics. If the Contractor requires additional clarification, he shall request it in writing, following the contractually prescribed information flow requirements.
- C. Should the drawings or specifications conflict within themselves, or with each other, the better quality, or greater size or quantity of work or materials shall be performed or furnished.

1.7 FUTURE WORK

- A. Provide for future work under requirements of Section 01 11 00.

1.8 ALLOWANCES

- A. Cash Allowance: Refer to Division 01 of the Construction Documents for information and requirements.

1.9 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner Contractor Agreement.
- B. Coordinate related work and modify surrounding work as required.
- C. Schedule of Alternates: See "Special Conditions" and Bid Form.

- D. Any Alternate Proposals are summarized in Division 01 of the specifications. The Contractor is directed to refer to all sections of the specifications and drawings for this project to determine the exact extent and scope of the various Alternate Proposals as each pertains to the work of all trades.

1.10 SUBMITTALS

- A. Refer to Division 1, UGC, and supplemental UGCs for specification requirements pertaining to timeliness of submission and review, quantity, and format. Each specification section describes the content of the submittals and any submittals which must be approved prior to submission of others.

- B. Proposed Products List: Include Products specified in the following sections:

1. Section 23 05 48 - Vibration Isolation
2. Section 23 05 53 - Mechanical Identification
3. Section 23 05 93 – Testing, Adjusting, and Balancing
4. Section 23 05 93.A – Testing, Adjusting, and Balancing – Contractor Responsibilities
5. Section 23 07 13 - Ductwork Insulation
6. Section 23 07 16 - Equipment Insulation
7. Section 23 09 23 - Direct Digital Control Systems
8. Section 23 31 00 - Ductwork
9. Section 23 33 00 - Ductwork Accessories
10. Section 23 36 00 - Air Terminal Units
11. Section 23 37 00 - Air Inlets and Outlets

- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories clearly marked and/or highlighted, with non-applicable information or data clearly noted in a single submittal.

- D. Mark dimensions and values in units to match those specified.

- E. Submit fabrication drawings whenever (1) equipment proposed varies in physical size and arrangement from that indicated on the drawings, thus causing rearrangement of equipment space, (2) where tight spaces require extreme coordination between ductwork, piping, conduit, and other equipment, (3) where called for elsewhere in these specifications; and (4) where specifically requested by the Architect/Engineer. Fabrication drawings shall be made at no additional charge to the Owner or the Architect/Engineer.

1.11 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. Refer to General Conditions for substitution of materials and equipment.

- B. General: Within thirty days after the date of contract award or work order, whichever is later, and before purchasing or starting installation of materials or equipment, the Contractor shall submit for review, a complete list of suppliers, contractors and manufacturers for all materials and equipment that will be submitted for incorporation into the project. The list shall be arranged in accordance with the organization of the specifications. This initial list shall include the manufacturer's name and type or catalog number as required to identify the quality of material or equipment proposed. This list will be reviewed by the Engineer and the Owner and will be returned to the Contractor with comments as to which items are acceptable without further submittal data and which items will require detailed submittal data for further review and subsequent approval. The initial list shall be submitted as herein specified. Materials and equipment requiring detailed submittal data shall be submitted with sufficient data to indicate that all requirements of these specifications have been met and samples shall be furnished when requested. All manufacturers' data used as part of the submittal shall have all inapplicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
- C. It is not the intent of the drawings and/or specifications to limit products to any particular manufacturer nor to discriminate against an "APPROVED EQUAL" product as produced by another manufacturer. Some proprietary products are mentioned to set a definite standard for acceptance and to serve as a reference in comparison with other products. When a manufacturer's name appears in these specifications, it is not to be construed that the manufacturer is unconditionally acceptable as a provider of equipment for this project. The successful manufacturer or supplier shall meet all of the provisions of the appropriate specification(s).
- D. The specified products have been used in preparing the drawings and specifications and thus establish minimum qualities with which substitutes must at least equal to be considered acceptable. The burden of proof of equality rests with the Contractor. The decision of the Architect/Engineer is final.
- E. When requested by the Architect/Engineer, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.
- F. Timeliness: The burden of timeliness in the complete cycle of submittal data, shop drawings, and sample processing is on the Contractor. The Contractor shall allow a minimum of six (6) weeks time frame for review of each submission by the office of the design discipline involved after receipt of such submissions by that design discipline. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all resubmittal cycles on unacceptable materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not be considered in any request for scheduled construction time extensions and/or additional costs to the Owner.
- G. All equipment installed on this project shall have local representation, local factory authorized service, and a local stock of repair parts.
- H. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Architect/Engineer has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.

- I. Certification: The Contractor shall carefully examine all data forwarded for approval and shall sign a certificate to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications.
- J. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of specified manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.
- K. Materials and Equipment Lists: Eight (8) copies of the list of materials and equipment, the name of manufacturer, trade name, type, and catalog number shall be submitted to the Architect/Engineer. The lists shall be accompanied by eight (8) sets of pictorial and descriptive data derived from the manufacturers' catalogs, sales literature, or incorporated in the shop drawings.
- L. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactory for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

1.12 MATERIALS AND WORKMANSHIP

- A. All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site but shall be replaced with new materials and/or equipment.
- B. The responsibility for the furnishing of the proper equipment and/or material and seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

1.13 FLAME SPREAD PROPERTIES OF MATERIALS

- A. Materials and adhesives incorporated in this project shall conform to NFPA Standard 255, "Method of Test of Surface Burning Characteristics of Building Materials" and NFPA 90. The classification shall not exceed a flame spread rating of 25 for all materials, adhesives, finishes, etc., specified for each system, and shall not exceed a smoke developed rating of 50.

1.14 REGULATORY REQUIREMENTS

- A. The "Authority Having Jurisdiction" over the project described by these documents is the Owner, as an Agency of the State of Texas. As such, it is required that the installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of these specifications. All referenced codes and standards shall be those current at the date of issue of the design documents.
- B. National Fire Protection Association Standards (NFPA)
 - 1. NFPA No. 45, Fire Protection for Laboratories Using Chemicals
 - 2. NFPA No. 51, Welding & Cutting, Oxygen-Fuel Gas Systems

3. NFPA No. 54, Gas Appliances, Piping, National Fuel Gas Code
 4. NFPA No. 70, National Electrical Code
 5. NFPA No. 72D, Proprietary Signaling Systems
 6. NFPA No. 90A, Air Conditioning Systems
 7. NFPA No. 91, Blower & Exhaust Systems
 8. NFPA No. 99, Health Care Facilities
 9. NFPA No. 101, Life Safety Code
 10. NFPA No. 211, Chimneys, Fireplaces, Vent Systems
 11. NFPA No. 241, Standard for Safeguarding Construction, Alteration and Demolition Operations
 12. NFPA No. 255, Method of Test of Surface Burning Characteristics of Building Materials
 13. NFPA No. 258, Standard Research Test Method for Determining Smoke Generation of Solid Materials
- C. Air Moving and Conditioning Association (AMCA): All current editions of applicable manuals and standards
- D. American National Standards Institute (ANSI)
- 1.B31.1, Power Piping
 - 2.B9.1, Safety Code for Mechanical Refrigeration
- E. Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these specifications.
- F. American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Codes
- G. American Society of Testing Materials (ASTM): All current editions of applicable manuals and standards
- H. National Electrical Manufacturers' Association (NEMA): All current editions of applicable manuals and standards.
- I. International Mechanical Code
- J. Texas Occupational Safety Act: All applicable safety standards.
- K. Occupational Safety and Health Act (OSHA).
- L. ADA and ANSI Standards: All work shall be in accord with all regulations and requirements of the Standards and Specifications for Handicapped and Disabled for the Construction of Public Buildings and Facilities in the State of Texas Usable by Physically Handicapped and Disabled persons, ANSI Standards and the requirements of the American Disabilities Act.

- M. Refer to specification sections hereinafter bound for additional Codes and Standards.
- N. All materials and workmanship shall comply with all applicable state and national codes, specifications, and industry standards. In all cases where Underwriters Laboratories, Inc. has established standards for a particular type material, such material shall comply with these standards. Evidence of compliance shall be the UL "label" or "listing" under Re-Examination Service.
- O. The Contract Documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately notify the Architect/Engineer in writing of said discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by Division 01 of these Contract Documents, providing no work of fabrication of materials has been accomplished in a manner of noncompliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations

1.15 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

- A. Storage at Site: The Contractor shall not receive material or equipment at the job site until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.
- B. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.
- C. Conformance with Agency Requirements: Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriters Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers or the Air Moving and Conditioning Association, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of the Underwriters Laboratories, Inc., applied to the item will be acceptable as sufficient evidence that the items conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements.
- D. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.
- E. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise, surfaces of ferrous metal shall be given a rust inhibiting coating. The treatment shall withstand 200 hours in salt spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8" on either side of the scratch mark. Where rust inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified except that coal tar or asphalt type coating will not be acceptable unless so stated for a specific item. Where steel is specified to be hot dip galvanized, mill galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-26915.
- F. Protection from Moving Parts: Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts shall be fully enclosed or properly guarded for personnel protection.

- G. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and become thoroughly familiar with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect/Engineer of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner or the Architect/Engineer.

1.16 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other sections. Obtain permission of [Owner] [Architect/Engineer] before proceeding.

1.17 MANUFACTURER'S RECOMMENDATIONS

- A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, testing, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Architect/Engineer, in writing, of any conflict between the requirements of the Contract Documents and the manufacturer's directions, and shall obtain the Architect/Engineer's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such instructions from the Architect/Engineer, he shall bear all costs arising in connection with the deficiencies.

1.18 SPACE AND EQUIPMENT ARRANGEMENT

- A. The size of Fire Protection equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Fabrication drawings shall be prepared when required by the Architect/Engineer or Owner to indicate a suitable arrangement.
- B. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.

1.19 LARGE APPARATUS

- A. Any large piece of apparatus that is to be installed in any space in the building, and that is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

1.20 PROTECTION

- A. The Contractor shall at all times take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of the work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the incomplete building with tarpaulins or other protective covering; the installation of electric heaters in electrical switchgear and similar equipment to prevent moisture damage. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B. Take particular care not to damage the building structure in performing work. All finished floors, step treads, and finished surfaces shall be covered to prevent any damage by workers or their tools and equipment during the construction of the building.
- C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these specifications.

1.21 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A. Each trade, subcontractor, and/or Contractor must work in harmony with the various other trades, subcontractors and/or Contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or Contractor must pursue its work promptly and carefully so as not to delay the general progress of the job. This Contractor shall work in harmony with Contractors working under other contracts on the premises.

1.22 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

- A. The Contractor shall note that the electrical design and drawings are based on the equipment scheduled and indicated on the drawings, and should any mechanical equipment be provided requiring changes to the electrical design, the required electrical changes shall be made at no cost to the Owner.
- B. The electrical trades shall provide all interconnecting wiring for the installation of all power. The electrical trades shall provide all disconnect switches as required for proper operation, as indicated on the drawings or required by applicable code. All combination starters, individual starters, and other motor starting apparatus not specifically scheduled or specified as provided by the equipment manufacturer under the scope of Division 23, shall be provided under the scope of Division 26.
- C. Provide complete wiring diagrams indicating power wiring and interlock wiring. Diagrams shall be submitted to the Architect/Engineer for review within thirty (30) days after the submittals for equipment have been reviewed. Diagrams shall be based on accepted equipment and shall be complete full phase and interlock control drawings, not a series of manufacturer's individual diagrams. After these diagrams have been reviewed by the Architect/Engineer, copies shall be transmitted to the electrical trades by the Contractor.

1.23 SUPERVISION

- A. Each Contractor and subcontractor shall keep a competent superintendent or foreman on the job at all times. (Refer to the Uniform General Conditions for additional information concerning supervision.)

- B. It shall be the responsibility of each superintendent to study all drawings and familiarize himself with the work to be done by other trades. He shall coordinate his work with other trades and before material is fabricated or installed, make sure that his work will not cause an interference with another trade. Where interferences are encountered, they shall be resolved at the job site by the superintendents involved. Where interferences cannot be resolved without major changes to the drawings, the matter shall be referred to the A/E for ruling.

1.24 SITE OBSERVATION

- A. Site observation by the Architect/Engineer is for the express purpose of verifying compliance by the Contractor with the Contract Documents, and shall not be construed as construction supervision nor indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.25 INSTALLATION METHODS

- A. Where to Conceal: All pipes shall be concealed in pipe chases, walls, furred spaces, or above the ceilings of the building unless otherwise indicated.
- B. Where to Expose: In mechanical rooms, janitor's closets tight against pan soffits in exposed "Tee" structures, or storage spaces, but only where necessary, piping may be run exposed. All exposed piping shall be run in the most aesthetic, inconspicuous manner, and parallel or perpendicular to the building lines.
- C. Support: All piping shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D. Maintaining Clearance: Where limited space is available above the ceilings below concrete beams or other deep projections, pipe shall be sleeved through the projection where it crosses, rather than hung below them in a manner to provide maximum above floor clearance. Sleeves shall be as herein specified. Approval shall be obtained from the Architect/Engineer for each penetration.
- E. All pipe shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All pipes run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that piping shall be sloped to obtain the proper pitch. Piping run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.
 - 1. All piping not directly buried in the ground shall be considered as "interior piping."
 - 2. Prior to the installation of any ceiling material, gypsum, plaster, or acoustical board, the Contractor shall notify the construction inspector so that arrangement can be made for an inspection of the above ceiling area about to be "sealed" off. The Contractor shall give as much advance notice as possible no less than 5 working days or as agreed by the Project Manager.

3. All above ceiling areas will be subject to a formal inspection before ceiling panels are installed, or installation is otherwise concealed from view. All mechanical and electrical work at and above the ceiling, including items supported by the ceiling grid, such as air inlets or outlets and lighting fixtures shall be complete and installed in accordance with contract requirements, including power to fans, and other powered items. Adequate lighting shall be provided to permit thorough inspection of all above ceiling items. The inspection will include representatives of the following: General Contractor and each Subcontractor having work above the ceiling, Architect/Engineer, Physical Plant, Resident Construction Manager's Construction Inspector(s), the Resident Construction Manager, and Office of Facilities Planning and Construction (OFPC). Areas to be included and time of inspection shall be coordinated with the Construction Inspector.
4. The purpose of this inspection is to verify the completeness and quality of the installation of the air conditioning systems, the electrical systems, the plumbing systems, and any other special above ceiling systems such as pneumatic tube, vacuum systems, fire sprinkler piping and cable tray systems. The ceiling supports (tee bar or lath) shall be in place so that access panel and light fixture locations are identifiable and so that clearances and access provisions may be evaluated.
5. No ceiling materials may be installed until the resulting deficiency list from this inspection is worked off and the Construction Inspector has given approval.

1.26 RECORDS FOR OWNER

- A. The Contractor shall maintain a set of "blueprint" prints in the Field Office for the sole purpose of recording "installed" conditions. Daily note all changes made in these drawings in connection with the final installation including exact dimensioned locations of all new underground utilities, services and systems and all uncovered existing active and inactive piping outside the building.
- B. At contract completion, the Contractor shall provide an electronic file of the revised drawings. The contractor shall transfer the information from the "blueprint" prints maintained as described above, and turn over this neatly marked set of reproducible drawings representing the "as installed" work to the Architect/Engineers for verification and subsequent transmittal to the Owner. The Contractor shall refer to Division 01 of these specifications, and to the Uniform General Conditions, for additional information. These drawings shall include as a minimum:
 1. Addendum written drawing changes.
 2. Addendum supplementary drawings.
 3. Accurate, dimensioned locations of all underground utilities, services and systems.
 4. Identification of equipment work shown on Alternates as to whether alternates were accepted and work actually installed.
 5. Change Order written drawing changes.
 6. Change Order supplementary drawings.
- C. Electronic Media
 1. The contractor shall submit three compact discs containing all the drawings in AUTOCAD 12 or 14 format.

- D. "As installed" plans shall bear a stamp, "stick-on decal" or lettered title block generally located in lower right hand corner of drawing entitled "AS INSTALLED DRAWING" with Company name of the installing trade Subcontractor and with a place for the date and the name of the responsible company representative.
- E. In addition to the above, the Contractor shall accumulate during the progress of the job the following data, in duplicate, prepared in a neat brochure or packet folder and turn over to the Architect/Engineer for review, and subsequent delivery to the Owner.
 - 1. All warranties and guarantees and manufacturers' directions on equipment and material covered by the Contract.
 - 2. Two sets of operating instructions for heating and cooling and other mechanical and electrical systems. Operating instructions shall also include recommended preventative maintenance and seasonal changeover procedures.
 - 3. Valve tag charts and diagrams specified herein.
 - 4. Approved wiring diagrams and control diagrams representing "as installed" conditions.
 - 5. Copies of approved shop drawings.
 - 6. Any and all other data and/or drawings required as submittals during construction.
 - 7. Repair parts list of all major items and equipment including name, address and telephone number of local supplier or agent.
- F. All of the above data shall be submitted to the Architect/Engineer for approval, and shall be corrected as instructed by the Architect/Engineer prior to submission of the final request for payment.

1.27 CUTTING AND PATCHING

- A. General: Cut and patch walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.
- B. Methods of cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Architect/Engineer. Impact type equipment shall not be used except where specifically acceptable to the Architect/Engineer. Openings in precast concrete slabs for pipes shall be core drilled to exact size.
- C. Restoration: All openings shall be restored to "as new" condition under the appropriate specification section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect/Engineer.
- E. Plaster: All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F. Special Note: No cutting, boring, or excavating that will weaken the structure shall be undertaken.

1.28 ROOF PENETRATIONS AND FLASHING

- A. Pipe, sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided and installed by a qualified contractor for all roof penetrations. This shall be the responsibility of the General Contractor.

1.29 EXCAVATION, TRENCHING AND BACKFILL

- A. Excavation (See Divisions 00 and 01 for special requirements related to excavation and trenching.):
 1. The subcontractors shall perform all excavations of every description, for their particular installations and of whatever substances encountered, to the depths indicated on the drawings and/or required for the installation of piping. All exterior lines shall be installed with a minimum cover of 24," unless otherwise indicated. Generally, more cover shall be provided if grade will permit. All excavation materials not required for backfill or fill shall be removed and wasted as acceptable to the Construction Inspector. All excavations shall be made only by open cut. The banks of trenches shall be kept as nearly vertical as possible and where required, shall be properly sheeted and braced. Trenches shall be not less than 12" wider nor more than 16" wider than the outside edges of the pipe to be laid therein, and shall be excavated true to line so that a clear space not less than 6" nor more than 8" in width is provided on each side of the pipe.
 2. The bottom of trenches shall be accurately graded to provide proper fall and uniform bearing and support for each section of the pipe on undisturbed soil or 2" of sand fill at every point along its entire length, except for portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints. Bell holes shall be dug after the trench bottom has been graded. Where inverts are not shown, grading shall be determined by the National Plumbing Code for the service intended and the size used. Bell holes for pipe joints shall be 12" in depth below the trench bottom and shall extend from a point 6" back of the face of the bell. Such bell holes shall be of sufficient width to provide ample room to complete the pipe joint . Bell holes for sewer tile and water pipe shall be excavated only to an extent sufficient to permit accurate work in the making of the joints and to insure that the pipe, for a maximum of its length, will rest upon the prepared bottom of the trench. Depressions for joints other than bell-and-spigot shall be made in accordance with the recommendations of the joint manufacturer for the particular type of joint used. Special pipe beds shall be provided as specified hereinafter.
 3. The lower 4" of the pipe trenches measuring from an overhead line set parallel to the grade line of the sewer shall be excavated only a few feet in advance to the pipe laying, by workers especially skilled in this type of work. Where damage is likely to result from withdrawing sheeting, the sheeting shall be left in place. Except at locations where excavation of rock from the bottom of trenches is required, care shall be taken not to excavate below the depths required. Where rock excavation is required, the rock shall be excavated to a minimum over depth of 6" below the trench depths specified. The over depth rock excavation and all excess trench excavation shall be backfilled with sand. Whenever wet or otherwise unstable soil is incapable of properly supporting the pipe is encountered in the trench bottom, such soil shall be removed to a depth and for the trench lengths required, and then backfilled to trench bottom grade, as hereinafter specified, with sand.

4. All grading in the vicinity of excavation shall be controlled to prevent surface ground water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other acceptable method. During excavation, material suitable for backfilling shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted and removed from the job site as directed by the Construction Inspector.
5. All shoring and sheeting required to perform and protect the excavations and to safeguard employees and/or adjacent structures shall be provided.
6. Excavate as required under the building in order that all piping, ductwork, etc., shall clear the ground a minimum of 12" for a distance of 24" on either side. Edges of such excavations shall slope at an angle of not over 45 degrees with the horizontal unless otherwise approved by the Construction Inspector. The bottom of such excavation shall be graded to drain in a manner acceptable to the Construction Inspector.
7. Trenches for water lines inside the building shall be properly excavated, following, in general, the procedures set out for exterior lines. Where floors are to be poured over these lines, they shall be backfilled, tamped and settled with water. Where no flooring is to cover the lines, they shall be backfilled to form a level grade.
8. All surplus materials removed in these trenching operations becomes the property of the contractor, and shall be disposed of at the expense of the contractor, at a legal disposal site, off of the campus.

B. Backfilling

1. Trenches shall not be backfilled until all required tests are performed and until the piping, utilities systems, etc., as installed are certified by the Owner's inspector to conform to the requirements specified hereinafter. The trenches shall be carefully backfilled with sand to a depth of 12 inches above the top of the pipe. The next layer and subsequent layers of backfill may be excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale, or other approved materials free from large clods of earth or stones larger than 1 1/2" in diameter, flooded until the pipe has cover of not less than one foot. The remainder of the backfill material shall then be thrown into the trenches, moistened, and tamped or flooded in one-foot layers. Blasted rock, broken concrete or pavement, and large boulders shall not be used as backfill material. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and mounded over, and smoothed off.
2. Backfill under concrete slabs-on-fill shall be as specified above, shall be gravel, or shall be other such materials more suitable for the application. Installation and compaction shall be as required for compatibility with adjacent materials.

- C. Opening and Re-closing Pavement and Lawns: Where excavation requires the opening of existing walks, streets, drives, other existing pavement, or lawns, such surfaces shall be cut as required to install new lines and to make new connections to existing lines. The sizes of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new work is completed and the excavation has been backfilled and flooded, the area shall be patched, using materials to match those cut out. The patches shall thoroughly bond with the original surfaces and shall be level with them, and shall meet all the requirements established by the authorities having jurisdiction over such areas.

- D. Excavation in Vicinity of Trees: All trees including low hanging limbs within the immediate area of construction shall be adequately protected to a height of at least 5 ft. to prevent damage from the construction operations and/or equipment. All excavation within the outermost limb radius of all trees shall be accomplished with extreme care. All roots located within this outermost limb radius shall be brought to the attention of the Construction Inspector before they are cut or damaged in any way. The Construction Inspector will give immediate instructions for the disposition of it. All stumps and roots encountered in the excavation, which are not within the outermost limb radius of existing trees, shall be cut back to a distance of not less than 18" from the outside of any concrete structure or pipeline. No chips, parts of stumps, or loose rock shall be left in the excavation. Where stumps and roots have been cut out of the excavation, clean compacted dry bank sand shall be backfilled and tamped.

1.30 OPERATION PRIOR TO COMPLETION

- A. When any piece of Fire Protection equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation, and has the Project Manager's written permission to do so. The warranty period shall, however, not commence until the equipment is operated for the beneficial use of the Owner, or date of substantial completion, whichever occurs first.
- B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust and complete all deficiency list items prior to being started, commissioned and before final acceptance by the Owner. The date of acceptance and performance certification will be the same date.

1.31 EXISTING FACILITIES

- A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workers, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.
- B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall them upon completion of work in the areas affected.
- D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall in locations approved by the Architect/Engineer all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature controls system devices, electrical switches, relays, fixtures, and piping.
- E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, coordination meetings shall be included in the contract amount.

1.32 DEMOLITION AND RELOCATION

- A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.
- B. All items that are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workers skilled in the work and in accordance with standard practice of the trades involved.
- C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.
- D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

1.33 CHECKING AND TESTING MATERIALS AND/OR EQUIPMENT

- A. Check inspections shall include heating, air conditioning, insulation, ventilating equipment, controls, mechanical equipment and such other items hereinafter specified or specifically designated by the Architect/Engineer.

1.34 COOPERATION AND CLEANUP

- A. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment and materials and shall clean his debris from the job. Upon the completion of the job, each trade shall immediately remove all of his tools, equipment, any surplus materials and all debris caused by that portion of the work.

1.35 CLEANING AND PAINTING

- A. All equipment and piping, etc., furnished and installed in exposed areas under Division 23 of these specifications and as hereinafter specified shall be cleaned, prepared, and painted according to the following specification. In the event of a conflict between the specifications referenced, the provisions of this specification shall prevail only for Division 23 work.

- B. All purchased equipment shall be delivered to the job with a suitable factory protective finish with the colors hereinafter specified. The following materials shall not be painted: copper, galvanized metal, stainless steel, fiberglass, PVC, and PVDF.
- C. Before painting, materials and equipment surfaces shall be thoroughly cleaned of cement, plaster, and other foreign materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metalwork shall be carefully brushed down with the steel brushes to remove rust and other spots and left smooth and clean.
- D. Two coats shall be applied with a light tint first coat and deep color for final coat. Colors shall be as follows:

ITEM	COLOR	"P and L" PAINT NUMBER
------	-------	------------------------

Hanger Rods	Same as "Piping" above	
Ductwork, AHU, Fans and Insulation	Buff	Y354M (Tawny Gold)

Jacketing on insulation shall not be painted.

- E. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible due to the painting operation.
- F. Scope of painting for Division 23--work in areas other than those defined as "exposed" is as follows:
 1. All uncovered steel pipe, supports, exposed pipe and hanger rod threads, and hangers in underfloor spaces shall be cleaned and painted with two coats of Tropical Paint Co. No. 77-black asphaltic emulsion. Galvanized steel and copper lines in these spaces shall not be painted.
 2. All canvas finishes including those underfloor and in concealed spaces shall be painted with one sizing coat if not already sized, containing mildew resistant additive and Arabol adhesive prior to any other specified finish paint.
 3. All fire protection piping shall be painted whether concealed or exposed, in all areas of the project without exception. Fire protection piping shall be painted safety red. These "safety" colors shall be as defined by OSHA.
 4. If insulated, the piping shall be primed, only, prior to insulation, and the insulation jacketing shall be painted as specified for piping. The requirements of this paragraph are "primary" and have priority over any conflicting specification or instruction, should a conflict in the Construction Documents exist.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. All equipment installed shall have local representation, local factory authorized service, and a local stock of repair parts.

- C. Responsibility for furnishing proper equipment and/or material and ensuring that equipment and/or material is installed as intended by the manufacturer, rests entirely upon the Contractor. Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.
- D. All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of Work involved. All Work shall be executed by mechanics skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job Site but shall be replaced with new materials and/or equipment.
- E. Materials and equipment manufactured domestically are preferred when possible. Materials and equipment that are not available from a domestic manufacturer may be by a non-domestic manufacturer provided they fully comply with Contract Documents.
- F. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise, surfaces of ferrous metal shall be given a rust inhibiting coating.

2.2 NAMEPLATES

- A. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.
- B. Nameplates shall be black laminated rigid phenolic with white core. Nameplate minimum size shall be 1 inch high by 3 inches long with 3/16-inch-high engraved white letters.
- C. Nameplate Fasteners: Fasten nameplates to the front of equipment only by means of stainless steel self-tapping screws. Stick-ons or adhesives will not be allowed unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.
- D. Nameplate Information: In general, the following information is to be provided for the types of electrical components or enclosures supplied with equipment.
 - 1. Individual Starters, Contactors, Disconnect Switches, and Similar Equipment: Identify the device, and voltage characteristics source and load served.

2.3 WALL, FLOOR AND CEILING PLATES (ESCUTCHEONS)

- A. Except as otherwise noted, provide stainless steel or chrome plated brass floor and ceiling plates around all pipes passing exposed through walls, floors or ceilings, in any spaces except underfloor and plenum spaces.
- B. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation.
- C. For finished ceiling installation, secure escutcheons to ceiling with escutcheon fasteners.
- D. Plates will not be required for piping where pipe sleeves extend 3/4-inch or more above finished floor.

2.4 ACCESS DOORS

- A. General: This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed items of mechanical equipment or devices.
- B. Doors: Access doors mounted in painted surfaces shall be of Milcor (Inland-Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surface of the adjacent finishes. Access doors mounted on tile surfaces shall be of similar construction as noted above, except they shall be of stainless steel materials. Access doors shall be a minimum of 12" x 12" in size.

2.5 ROOF PENETRATIONS AND FLASHING

- A. Pipe sleeves, pitch pockets and flashings compatible with the roofing installation shall be provided and installed for all roof penetrations by a contractor qualified in such Work. Installation shall comply with the Contract Documents and with FM General Data Sheets 1-28, 1-29, 1-31 & 1-49 along with the FM approval guide.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.
- B. The size of equipment indicated on the Drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine that the equipment proposed will fit in the space. Fabrication Drawings shall be prepared when required by the Architect/Engineer or Owner to indicate a suitable arrangement.
- C. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- D. Space Requirements:
 - 1. Consider space limitations imposed by contiguous Work in location of equipment and material. Do not provide equipment or material which is not suitable in this respect.
 - 2. Make changes in material and equipment locations of up to five (5) feet, to allow for field conditions prior to actual installation, and as directed by the Architect/Engineer at no additional cost to the Owner.
- E. Contractor shall note that the electrical design and Drawings are based on the equipment scheduled and indicated on the Drawings. Should any equipment be provided requiring changes to the electrical design, the required electrical changes shall be made at no cost to the Owner.

3.2 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

- B. All installation shall be in accordance with manufacturer's published recommendations, as shown on the drawings and stated in the specifications.
- C. Piping may be run exposed in rooms typically without ceilings such as mechanical rooms, janitor's closets, tight against pan soffits in exposed "tee" structures, or storage spaces, but only where necessary. Shutoff and isolation valves shall be easily accessible.
- D. All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that piping shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.
- E. Prior to the installation of any ceiling material, gypsum, plaster or acoustical board, the Contractor shall notify Project Manager so that arrangement can be made for an inspection of the above-ceiling area about to be "sealed" off. The Contractor shall provide written notification to the Owner at least five (5) calendar days prior to the inspection.
- F. Precedence of Materials:
 - 1. The Specifications determine the nature and setting of materials and equipment. The Drawings establish quantities, dimensions and details.
 - 2. If interference is encountered, the following installation precedence of materials shall guide the Contractor to determine which trade shall be given the "Right of Way":
 - a. Building lines
 - b. Structural members
 - c. Structural support frames supporting ceiling equipment
 - d. Electric tracked vehicle system
 - e. Pneumatic trash and linen system
 - f. Pneumatic tube system
 - g. Soil and drain piping
 - h. Vent piping
 - i. Supply, return and outside air ductwork
 - j. Exhaust ductwork
 - k. HVAC water and steam piping
 - l. Condensate piping
 - m. Fire protection piping
 - n. Natural gas piping
 - o. Medical/Laboratory gases

- p. Domestic water (cold and hot, softened, treated)
 - q. Refrigerant piping
 - r. Electrical conduit
3. Coordinate fire protection system with other trade systems as required to maintain system right-of-ways.

3.3 TESTING

- A. When any piece of equipment is operable and it is to the advantage of the Contractor to operate the equipment, Contractor may do so, provided that Contractor properly supervises the operation, and has the Project Manager's written permission to do so. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner, or date of Substantial Completion, whichever occurs first.
- B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean and properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and performance certification will be the same date.
- C. The Contractor shall execute, at no additional cost to the Owner, any tests required by the Owner or the National Fire Protection Association, ASTM, etc. Standards listed. The Contractor shall provide all equipment, materials and labor for making such tests. The Owner will pay reasonable amounts of fuel and electrical energy costs for system tests. Fuel and electrical energy costs for system adjustment and tests, which follow Substantial Completion by the Owner, will be borne by the Owner.
- D. Notify the Project Manager and the Architect/Engineer in writing at least five (5) calendar days or as agreed by the Project Manager prior to each test and prior to other Specification requirements requiring Owner and Architect/Engineer to observe and/or approve tests.
- E. All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel performing, observing and inspecting, description of the test and extent of system tested, test conditions, test results, specified results and other pertinent data. Data shall be delivered to the Architect/Engineer as specified under "Requirements for Final Acceptance." The Contractor or Contractor's authorized job superintendent shall legibly sign all Test Log entries.
- F. Maintain Log of Tests as hereinafter specified.
- G. See specifications hereinafter for additional tests and requirements.
- H. Refer to Commissioning Specification Sections for additional Start-up, prefunctional and operational checkout, and for functional performance test procedures.

3.4 TRAINING

- A. Operating and Maintenance Manuals and instruction shall be provided as specified under the Division 01 Section entitled "Project Closeout Procedures."

END OF SECTION 21 00 00

SECTION 23 05 13 – MOTORS

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

- A. Single phase electric motors
- B. Three phase electric motors
- C. The Contractor shall provide all motors required for equipment supplied under this Division of the work

1.3 RELATED WORK

- A. Section 23 22 00.A - Steam and Steam Condensate Specialties: Condensate pumps
- B. Section 23 20 00 - HVAC Pumps
- C. Section 23 81 23 - Computer Room Air Conditioning Units
- D. Section 23 82 19 - Terminal Heat Transfer Units: Unit heaters, fan-coil units, and unit ventilators
- E. Section 23 73 00 - Air Handling Unit with Coils (Up to 10,000 CFM): Fan motors
- F. Section 23 73 23 - Air Handling Unit: Fan motors
- G. Section 23 34 16 - Fans

1.4 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings
- C. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators
- D. ANSI/NEMA MG 1 - Motors and Generators
- E. ANSI/NFPA 70 - National Electrical Code

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 23 00 00
- B. Submit test results verifying nominal efficiency and power factor for motors 1 horsepower and larger.
- C. Submit manufacturer's installation instructions under provisions of Section 23 00 00

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 23 00 00
- B. Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum three-years documented product development, testing, and manufacturing experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 23 00 00.
- B. Store and protect products under provisions of Section 23 00 00.
- C. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.10 WARRANTY

- A. Provide five year manufacturer's warranty under provisions of Section 23 00 00.
- B. Warranty: Include coverage for motors 1 horsepower and larger.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Open Design Motors: Design for continuous operation in 40 degrees C environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, Service Factor, and motor enclosure type.
- B. Totally Enclosed Motors: Design for a service factor of 1.00 and an 80 degrees C maximum temperature rise in the same conditions.
- C. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, Service Factor, Power Factor, efficiency.
- E. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.
- F. Motors shall be built in accordance with the latest ANSI, IEEE, and NEMA Standards, and shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics

scheduled, and of approved manufacture as described herein or of the same manufacture as the equipment which they serve. All motors provided by the Contractor shall be of the same manufacture unless they are an integral part of the piece of equipment to which they are attached. Nameplate rating of motors shall match the characteristics scheduled.

- G. All motors shall be designed for NEMA Design B starting torque unless the driven machine requires high starting torque and shall be selected for quiet operation, free from magnetic hum.
- H. In addition, all motors shall be provided with adequately sized electrical connection box with threaded hub for attachment of flexible conduit, unless bus duct connection is indicated. Where motors are connected to driven equipment by the use of a V-belt drive, they shall be furnished with adjustable rails.
- I. Dynamic Balance shall be no greater than the vibration limits of the driven equipment.
- J. All motors shall be provided with all copper windings, terminal wiring, and copper or bronze lugs. AL/CU rated connectors are not allowed.

2.2 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.
- F. Single phase motors, in general, shall be less than 3/4 horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors with drip-proof enclosures except as hereinafter specified. These motors shall have built-in thermal overload protection with automatic reset, and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.3 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, pre-lubricated sleeve or ball bearings, automatic reset overload protector.
- E. Single phase motors, in general, shall be less than 3/4 horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors. These motors shall have built-in thermal overload protection with automatic reset, and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.4 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Enclosures shall be of the open drip-proof type with a service factor of 1.15 and Class B insulation rated at 90 degrees C temperature rise measured above 40 degrees C room ambient condition at full load, unless otherwise noted.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.
- H. Single phase motors, in general, shall be less than 3/4 horsepower and shall be permanent split phase, capacitor start, induction run, 120 volt, 60 hertz motors. These motors shall have built-in thermal overload protection with automatic reset, and shall be rated for temperature rise as hereinbefore specified for 3-phase motors.

2.5 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Acceptable Manufacturers: Subject to conformance with these specifications, furnish motors by one of the following manufacturers:
 - 1. Baldor
 - 2. TECO/Westinghouse
 - 3. Toshiba
 - 4. General Electric
- B. In general, all motors 3/4 horsepower and larger, unless smaller motors are indicated to be supplied as 3-phase, shall be 3-phase and shall be squirrel cage premium efficiency induction type with standard NEMA frame sizes.
- C. All three phase motors shall be inverter duty rated and equipped with a shaft grounding device. Inverter duty motors shall be capable of withstanding repeated peaks of 1600 volts at 0.1 microsecond rise time and comply with NEMA MG-1 Part 31.
- D. Motors 1 HP and larger shall have integral frames.
- E. Starting Torque: Between one and one and one-half times full load torque.
- F. Starting Current: Six times full load current.
- G. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B Characteristics.
- H. Design, Construction, Testing, and Performance: Conform to ANSI/NEMA MG 1 for Design B motors.
- I. Insulation System: NEMA Class B or better.

- J. Testing Procedure: In accordance with ANSI/IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data. Test and balance motors to limits defined in 2.01J.
- K. Motor Frames: NEMA standard T-frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- L. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter or VFD; refer to Division 26 for Starter Requirements. Refer to Specification Section 23 29 23 for Variable Frequency Drives.
- M. Bearings: Ball or roller type, double shielded with continuous grease relief to accommodate excessive pressure caused by thermal expansion or over lubrication. All motor bearings shall be factory pre-packed with a non-detergent lubricant, and shall be provided with lubrication fitting arranged to provide easy access when installed on the driven apparatus except as noted hereinafter. Permanently lubricated factory-sealed motors may be provided in fractional HP sizes only where they are an integral part of a piece of approved apparatus. All bearings shall be designed for L-10, 200,000 hour minimum life hours of continuous service. Calculate bearing load with NEMA minimum V- belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- N. Sound Power Levels: Refer to ANSI/NEMA MG 1.
- O. Weatherproof Epoxy Treated Motors (Where Indicated): Epoxy coat windings with rotor and starter surfaces protected with epoxy enamel. Bearings shall be double shielded with waterproof non-washing grease.
- P. Nominal Efficiency: Furnish all motors with minimum efficiency equal to or greater than Efficiency Level of Premium Efficiency Motors as defined in the latest version of NEMA MG-1.
- Q. Service Factor: M Furnish all motors with service factor equal to or greater than that required in the latest version of NEMA MG-1
- R. Motors 1 HP and larger shall be provided with a copper frame grounding lug of hydraulic compression design, for installation by the electrical subcontractor.
- S. Motors 3/4 HP and larger shall have 120V space heater that is energized only when motor is idle. (Galveston only.)

PART 3 - EXECUTION

3.1 APPLICATION

- A. Motors drawing less than 250 Watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.
- B. Motors shall be open drip-proof type, unless specified otherwise.
- C. Single phase motors for shaft mounted fans shall be split phase type.
- D. Single phase motors for shaft mounted fans or blowers shall be permanent split capacitor type.
- E. Single phase motors for fans, blowers, air compressors shall be capacitor start type.
- F. Single phase motors for fans, blowers shall be capacitor start, capacitor run type.

- G. Motors located in exterior locations, air-cooled condensers, direct drive axial fans, roll filters, explosion proof environments, dust collection systems, lint collectors, inline fans shall be totally enclosed type.
- H. Motors located in exterior locations, air-cooled condensers, direct drive axial fans, roll filters, explosion proof environments, dust collection systems, lint collectors, inline fans shall be totally enclosed weatherproof epoxy-treated type.

END OF SECTION 23 05 13

SECTION 23 05 16

EXPANSION COMPENSATION

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification
- D. Section 23 20 00.A – Pipes, Valves, and Fittings

1.2 SECTION INCLUDES

- A. Flexible pipe connectors
- B. Expansion joints and compensators
- C. Pipe loops, offsets, and swing joints

1.3 RELATED SECTIONS

- A. Section 23 21 00 - Hydronic Pumping
- B. Section 23 22 00 - Steam and Steam Condensate Piping
- C. Section 23 23 00 - Refrigerant Piping and Specialties

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.
- B. Expansion Calculations:
 - 1. Installation Temperature: 50 degrees F.
 - 2. Chilled water: 42 degrees F.
 - 3. Heating Hot Water: 210 degrees F.
 - 4. Safety Factory: 30 percent.

1.5 SUBMITTALS

- A. Submit under provisions of Section 23 00 00 .
- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
 - C. Samples: Submit two low pressure compensators 1 inch in size.
 - D. Design Data: Indicate selection calculations.
 - E. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.
- 1.6 PROJECT RECORD DOCUMENTS
- A. Submit under provisions of Section 23 00 00.
 - B. Record actual locations of flexible pipe connectors, expansion joints, anchors, and guides.
- 1.7 OPERATION AND MAINTENANCE DATA
- A. Submit under provisions of Section 23 00 00.
 - B. Maintenance Data: Include adjustment instructions.
- 1.8 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
 - B. Design expansion compensating system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Texas.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.
 - B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.
 - C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.
- 1.10 WARRANTY
- A. Provide five-year warranty.
 - B. Warranty: Include coverage for leak free performance of packed expansion joints.
- 1.11 EXTRA MATERIALS
- A. Provide two 12 ounce containers of packing lubricant and cartridge style grease gun.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

- A. Steel Piping:
 1. Manufacturers:
 - a. Metraflex

- b. Flex-Weld
 - c. Flexicraft
 2. Inner Hose: ASTM Grade 304, 316, or 321 Stainless Steel.
 3. Exterior Sleeve: Double braided ASTM Grade 304, 316, or 321 stainless steel.
 4. Pressure Rating: 150 psig WOG at 250 degrees F for circulating water systems; 125 SWP at 400 F for steam
 5. Joint: As specified for pipe joints.
 6. Size: Use pipe sized units.
 7. Maximum offset: 3/4 inch on each side of installed center line.
 8. Application: Pump connections and vibration isolating connections on steel circulating water systems.
- B. Single/Double Flexible Sphere :
1. Manufacturers:
 - a. Metraflex
 - b. Flex-Weld
 - c. Kinetics Noise Control
 2. Body: EPDM (Teflon)
 3. Working Pressure: 225 psi at 170 F
 4. Maximum Temperature: 225 degrees F.
 5. Maximum Compression: Single sphere: 1/2 inch; double sphere: 1 3/4 inches
 6. Maximum Elongation: Single sphere: 1/8 inch; double sphere: 1/2 inch
 7. Maximum Offset: Single sphere: 3/8 inch; double sphere: 3/4 inch
 8. Maximum Angular Movement: 15 degrees.
 9. Joint: As specified for pipe joints.
 10. Size: Use pipe sized units.
 11. Accessories: Control rods or control cables to prevent overextension
 12. Application: Pump connections and vibration isolating connections on circulating water systems.
- C. Copper Piping:
1. Manufacturers:
 - a. Metraflex

- b. Flex-Weld
- c. Flexicraft
2. Inner Hose: Bronze
3. Exterior Sleeve: Double-braided bronze.
4. Pressure Rating: 150 psig WOG and 250 degrees F.
5. Joint: As specified for pipe joints.
6. Size: Use pipe sized units.
7. Maximum offset: 3/4 inch on each side of installed center line.
8. Application: Pump connections and vibration isolating connections on copper circulating water systems.

2.2 FLEXIBLE HOSE EXPANSION LOOPS

A. General Requirements:

1. All flexible pipe connectors shall be double braided.
2. Stainless steel flexible pipe connectors shall be used with steel pipe; bronze flexible pipe connectors shall be used with copper pipe.
3. Flexible hose expansion loops shall be manufactured complete. Field fabricated loops are not acceptable.
4. Flexible hose expansion loop shall impart no thrust loads to system supports, anchors, or the building structure.
5. All flexible hose expansion loops shall be manufactured in accordance with ASME BPVC Section IX.
6. Flexible expansion loops shall have a factory supplied, hanger/support lug located at the bottom of the 180 degree return.
7. Flexible expansion loops shall be furnished with a plugged FPT fitting for a vent or drain. For pipes 1"—6", the fitting shall be 3/8" FPT; for pipes 8" and larger, the fitting shall be 1/2" FPT.
8. On steam systems, hose shall be installed horizontally with a drip leg and steam trap upstream of compensator.

B. Piping:

1. Manufacturers:
 - a. Metraflex
 - b. Flex-Weld
 - c. Flexicraft
2. Inner Hose: ASTM Grade 304, 316, or 321 Stainless Steel.

3. Exterior Sleeve: Double braided ASTM Grade 304, 316, or 321 stainless steel.
4. Pressure Rating: 150 psig WOG at 250 degrees F for circulating water systems; 125 SWP at 400 F for steam
5. Joint: As specified for pipe joints.
6. Size: Use pipe sized units.
7. Maximum offset: 3/4 inch on each side of installed center line.
8. Application: steel circulating water systems and low and medium pressure steam systems.

C. Copper Piping:

1. Manufacturers:
 - a. Metraflex
 - b. Flex-Weld
 - c. Flexicraft
2. Inner Hose: Bronze
3. Exterior Sleeve: Double-braided bronze.
4. Pressure Rating: 150 psig WOG and 250 degrees F.
5. Joint: As specified for pipe joints.
6. Size: Use pipe sized units.
7. Maximum offset: 3/4 inch on each side of installed center line.
8. Application: copper circulating water systems.

2.3 EXPANSION JOINTS

1. Stainless Steel Bellows Type: Manufacturers:
 - a. Metraflex
 - b. Unaflex
 - c. Flex-Weld
 - d. Flexicraft
2. Bellows material shall be ASTM Grade 304, 316, or 321.
3. Pressure Rating: 125 psig WSP and 400 degrees F for low and medium pressure steam; 150 psig WOG and 250 degrees F for circulating water.
4. Maximum Compression: 1 1/2"
5. Maximum Extension: 1/4".

6. Joint: As specified for pipe joints.
7. Size: Use pipe sized units.
8. Application: Steel piping 3 inch and under where expected thermal expansion is less than 1 ½". When used for chilled water, bellows shall be preloaded to expected contraction distance per expansion calculations.

2.4 ACCESSORIES

A. Pipe Alignment Guides:

1. Manufacturers:
 - a. Metraflex
 - b. Flexicraft
 - c. Twin City Hose, Inc.
2. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Construct spool pieces to exact size of flexible connection for future insertion.
- C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where indicated.
- G. Provide expansion loops as indicated on drawings.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Section 23 00 00.
- B. Provide inspection services by flexible pipe manufacturer's representative for final installing and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION 23 05 16

SECTION 23 05 29

SLEEVES, FLASHINGS, SUPPORTS, AND ANCHORS

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

- A. Pipe and equipment hangers and supports
- B. Equipment bases and supports
- C. Sleeves and seals
- D. Flashing and sealing equipment and pipe stacks

1.3 RELATED SECTIONS

- A. Section 23 05 4 Vibration Isolation
- B. Section 23 07 19 Piping Insulation
- C. Section 23 07 16 Equipment Insulation
- D. Section 23 07 16 Ductwork Insulation

1.4 REFERENCES

- A. ASME B31.1 Power Piping
- B. ASME B31.5 Refrigeration Piping
- C. ASME B31.9 Building Services Piping
- D. ASTM F708 Design and Installation of Rigid Pipe Hangers
- E. MSS SP58 Pipe Hangers and Supports Materials, Design and Manufacturer
- F. MSS SP69 Pipe Hangers and Supports Selection and Application
- G. MSS SP89 Pipe Hangers and Supports Fabrication and Installation Practices

1.5 SUBMITTALS

- A. Submit under provisions of Section 23 00 00.
- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data: Provide manufacturers catalog data including load capacity.

- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for support of hydronic, steam and steam condensate piping.

PART 2 - PRODUCTS

2.1 HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Anvil
 - 2. Kindorf
 - 3. B-Line
 - 4. Power Strut
- B. Supports, hangers, anchors and guides shall be provided for all horizontal and vertical piping. Shop Drawings shall be provided, indicating locations and details of anchors, guides, expansion loops and joints, hangers, etc. The hanger design shall conform to the ASME Code for Pressure Piping.
- C. All auxiliary steel required for supports, anchors, guides, etc. shall be provided by the Mechanical Trades unless specifically indicated to be provided by others.
- D. The supports, hangers, anchors, and guides for the chilled water supply and return piping, steam piping, condensate return piping, etc. of the Campus Loop System routed through utility tunnels and below buildings shall be provided as indicated on the Drawings.
- E. Contractor shall review all Drawings, including Structural Drawings, for details regarding pipe supports, anchors, hangers, and guides.
- F. All Supports shall be of type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.
- G. All rod sizes indicated in this Specification are minimum sizes only. This trade shall be responsible for structural integrity of all supports, anchors, guides, etc. All structural hanging materials shall have a minimum safety factor of 5 built in.
- H. Anchor points as indicated on Drawings or as required shall be located and constructed to permit the piping system to take up its expansion and contraction freely in opposite directions away from the anchored points.
- I. Guide points shall be located and constructed wherever required or indicated on Drawings and at each side of an expansion joint or loop, to permit free axial movement only.
- J. Supports, hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system.
- K. Hangers supporting and contacting brass or copper lines 3" in size and smaller shall be Anvil Fig. CT-65 , adjustable, copper plated, clevis hanger. Hangers supporting and contacting brass or copper lines 4" and larger shall be Anvil Fig. 260, adjustable clevis, with a nut above and below the hanger, and approved neoprene isolating material between pipe (or tubing) and hanger on the support rod. For insulated copper or brass domestic water lines, hangers for all sizes of pipe

shall be Anvil Fig. 300, adjustable clevis, with a nut above and below the hanger, and approved neoprene isolating material between pipe (or tubing) and hanger on the support rod. Isolate all copper or brass lines from all ferrous materials with approved dielectric materials. Hangers supporting and contacting plastic or glass piping shall be of equal design, but shall be padded with neoprene material or equal. The padding material and the configuration of its installation shall be submitted for approval.

- L. Hangers supporting insulated lines where the outside diameter of the insulation is the equivalent of 8" diameter pipe or smaller in size and supporting all ferrous lines 6" and smaller in size shall be Anvil Fig. 260, adjustable clevis, with a nut above and below the hanger on the support rod.
- M. Hangers supporting and contacting ferrous lines larger than 6" in size and outside of insulation on lines with the outside diameter equivalent to 10" diameter pipe shall be Anvil Fig. 260, adjustable clevis, with a nut above and below the hanger on the support rod.
- N. Other special type of hangers may be employed where so specified or indicated on the Drawings, or where required by the particular conditions. In any case, all hangers must be acceptable to the owner.
- O. Each hanger shall be properly sized to fit the supported pipe or fit the outside of the insulation on lines where specified. Hangers for dual or low temperature insulation pipes shall bear on the outside of the insulation, which shall be protected by support shields as specified in Section 23 07 19 PIPING INSULATION. Protect insulation from crushing by means of a section of rigid insulation to be installed at hanger points. Hangers for high temperature insulated pipes and all insulated hot and cold domestic water pipes shall be encased in the insulation unless supported by trapezes in which case shield and rigid insulation shall be provided as specified above for low temperature insulated pipes.
- P. Supports for vertical piping in concealed areas shall be double bolt riser clamps, Anvil Fig. 261, or other approved equal, with each end having equal bearing on the building structure, and located at each floor. Two hole rigid pipe clamps at 4 ft. o.c. or Kindorf channels and Anvil Fig. 261 riser clamps may be used to support pipe directly from vertical surfaces or members where lines are not subject to expansion and contraction. When piping is subject to expansion and contraction, provide spring isolators (see Section 23 05 48 - Vibration Isolation). Where brass or copper lines are supported on trapeze hangers or Kindorf channels the pipes shall be isolated from these supports with plastic tape with insulating qualities, or strut clamps as manufactured by Specialty Products Company, Stanton, California.
- Q. Supports for vertical piping in exposed areas (such as fire protection standpipe in stairwells) shall be attached to the underside of the building structure above the top of the riser, and the underside of the penetrated structure. The contractor shall use a drilled anchor as specified above, and use an Anvil No. 595 Socket Clamp with Anvil No. 594 Socket Clamp Washers, as a riser clamp. The top riser hanger shall consist of two (2) hanger rods (sized as specified) anchored to the underside of the building structure, supporting the pipe by means of the material specified. Risers penetrating floors shall be supported from the underside of the penetrated floor as specified for the top of the riser.
- R. Pipe Supports in Chases and Partitions: Horizontal and vertical piping in chases and partitions shall be supported by hangers or other suitable support. Pipes serving plumbing fixtures and equipment shall be securely supported near the point where pipes penetrate the finish wall. Supports shall be steel plate, angles, or special channels such as Unistrut mounted in vertical or horizontal position. Pipe clamps such as Unistrut P2426, P2008, P1109 or other approved clamps shall be attached to supports. Supports shall be attached to wall or floor construction with clip angles, brackets, or other approved method. Supports may be attached to cast iron pipe with pipe clamp, or other approved method. All copper or brass lines shall be isolated from ferrous metals with dielectric materials to prevent electrolytic action.

- S. Perforated strap iron or wire will not, under any circumstances, be acceptable as hanger material.
- T. Vibration Isolation: Resilient hangers shall be provided on all piping connected to rotating equipment (pumps, etc.). Piping or ductwork that may vibrate and create an audible noise shall also be isolated. Spring hangers or supports shall be provided where indicated on the Drawings and/or specified under Section 23 05 48.
- U. Attachment:
1. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete which holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required.
 2. Inserts shall be of a type which will not interfere with reinforcing as shown on the structural Drawings and which will not displace excessive amounts of structural concrete.
 3. All supports shall be designed and installed to avoid interference with other piping, hangers, ducts, electrical conduit, supports, building structures, equipment, etc. All piping shall be installed with due regard to expansion and contraction and the type of hanger method of support, location of support, etc. shall be governed in part by this Specification.
 4. Hangers shall be attached to the structure as follows:
 - a. Poured In Place Concrete: Where pipes and equipment are supported under poured in place concrete construction, each hanger rod shall be fitted with a nut at its upper end, which nut shall be set into an Underwriters Laboratories, Inc. listed universal concrete insert placed in the form work before concrete is poured. Where inserts are placed in the bottom faces of concrete joists which are too narrow to provide adequate strength of concrete to hold the insert properly or where a larger insert would require displacement of the bottom joist steel, the hanger rod shall be suspended from the center of a horizontal angle iron, channel iron, I beam, etc. spanning across two adjacent joists. The horizontal support shall be bolted to nonadjustable concrete inserts of the "spot" type, of physical size small enough to avoid the bottom joist steel.
 - b. Steel Bar Joists: Where pipes and loads are supported under bar joists, hanger rods may be run through the space between the bottom angles and secured with a washer and two nuts. Where larger lines are supported beneath bar joists, hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded to the joists or otherwise permanently fixed thereto.
 - c. Steel Beams: Where pipes and loads are supported under steel beams, approved type beam clamps shall be used.
 - d. Wood Framing: Where pipes and loads are supported from wood framing, hanger rods shall be attached to framing with side beam brackets or angle clips.
 - e. Pre Cast Tee Structural Concrete: Hanger supports, anchors, etc. required for mechanical systems attached to the precast, double tee, structural concrete system are to be installed in accord with approved shop Drawings only. Holes required for hanger rods shall be core drilled in the "flange" of the double tee only; impact type tools are not allowed under any circumstances. Core drilling in the "stem" portions of the double tee is not allowed. Holes core drilled through the "flange" for hanger rods shall be no greater than 1/4" larger than the diameter of the hanger rod. Hanger rods shall be supported by means of bearing plates of size and shape acceptable to the Architect/Engineer, with welded double nuts on the hanger rod above the bearing plate. Cinch anchors, lead shields, expansion bolts, and studs driven by explosion charges are not allowed under any circumstances in the lower 15" of each stem and in the "shadow" of the stem on the top side of the "double tees."

- f. If it is necessary to install a method of fastening a hanger after the structure has been installed, then only clamps or drilled anchors shall be used.
 - g. Note: Power actuated fasteners (shooting) will not be acceptable under any circumstances.
 - h. Note: Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.
- V. Trapezes: Where multiple lines are run horizontally at the same elevation and grade, they may be supported on trapezes of Anvil, Kindorf, Uni-Strut, Power Strut, or approved equal, channel suspended on rods or pipes. Trapeze members including suspension rods shall each be properly sized for the number, size, and loaded weight of the lines they are to support.
- W. Finishes: All hangers on piping including clevis hangers, rods, inserts, clamps, stanchions, and brackets, shall be dipped in Zinc Chromate Primer before installation. Rods may be galvanized or cadmium plated after threading, in lieu of dipping zinc chromate. Universal concrete inserts shall be cadmium plated.
- X. Ductwork: All ductwork shall be supported in accordance with the SMACNA recommendation for the service involved; however, all horizontal ductwork shall be supported at intervals not to exceed the scheduled values indicated elsewhere in this section. Horizontal ducts shall be supported using galvanized steel bands extending up both sides and onto the construction above, where they shall turn over and be secured with bolts and nuts fitted in inserts set in the concrete bolted to angles secured to the construction above, or secured in another approved manner. For attaching methods for precast double tee structural concrete, refer to details on the Drawings and as specified herein.
- Y. Terminal units shall be supported by four 16 gauge, 1" wide sheet metal straps which shall be folded under the bottom of the casing a minimum of 1". Attach each strap to bottom of terminal unit with two sheet metal screws not larger than $\frac{3}{4}$ " in length and not more than $\frac{1}{4}$ " in diameter. The straps shall be attached to the structure by a $\frac{1}{4}$ " diameter threaded bolt into a concrete insert or into a drilled hole with a threaded concrete expansion anchor. Where interferences occur, overhead of the box, not allowing direct vertical support by straps, provide trapezes of Kindorf, Unistrut, or B-Line channel suspended by $\frac{1}{4}$ " diameter galvanized threaded rods providing such channels do not block access panels of boxes. Threaded rods shall be supported from structure by concrete insert or by drilled-hole threaded concrete expansion anchor.
- Z. Miscellaneous: Provide any other special foundations, hangers and supports indicated on the Drawings, specified elsewhere herein; or required by conditions at the site. Hangers and supporting structures for suspended equipment shall be provided as required to support the load from the building structure in a manner acceptable to the Architect/Engineer.

2.2 ACCESSORIES

- A. Hanger Rods: Galvanized mild steel threaded both ends, galvanized threaded one end, or galvanized continuous threaded.
- B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction. If the inserts are later found not to be in the proper location for the placement of hangers, then drilled anchors shall be installed. Drilled anchors in concrete or masonry shall be submitted for the approval by the Owner.

2.3 FLASHING AND EQUIPMENT CURBS

- A. Metal Flashing: 26 gauge galvanized (stainless steel) steel.

- B. Metal Counterflashing: 22 gauge galvanized (stainless steel) steel.
- C. Roofing Flashing: See specifications for Roofing, elsewhere in these Specifications.
- D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.
- E. Curbs: Welded 18 gauge galvanized steel shell and base, mitered 3 inch cant, variable step to match roof insulation, factory installed wood nailer.

2.4 CONCRETE FOUNDATIONS ("HOUSEKEEPING PADS"):

- A. Concrete foundations for the support of equipment such as floor mounted panels, pumps, fans, air handling units, etc., shall extend 4" on all sides beyond the limits of the mounted equipment unless otherwise noted and shall be poured in forms built of new dressed 6" nominal lumber. All corners of the foundations shall be neatly chamfered by means of sheet metal or triangular wood strips nailed to the form. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Each bolt shall be set in a sleeve of size to provide 1/2" clearance around bolt. Allow 1" below the equipment bases for alignment and grouting. After grouting, the forms shall be removed and the surface of the foundations shall be hand rubbed with carborundum. Foundations for equipment located on the exterior of the building shall be provided as indicated. Foundations shall be constructed in accordance with Shop Drawings submitted by the Contractor for review by the Architect/Engineer.

2.5 WALL, FLOOR AND CEILING PLATES:

- A. Except as otherwise noted, provide C.P. (Chrome plated) brass floor and ceiling plates around all pipes, conduits, etc., passing exposed through walls, floors, or ceilings, in any spaces except underfloor and attic spaces. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines which are insulated and positively secured to such pipe or insulation. Plates will not be required for piping where pipe sleeves extend 3/4" above finished floor. All equipment rooms are classified as finished areas. Round and rectangular ducts shall have closure plates (NOT chrome plated) made to fit accurately at all floor, wall and ceiling penetrations. Floor penetrations in exposed (except in stair wells) areas shall be finished using 'bell' fitting to fit pipe or insulation and sleeve and shall be painted to match the pipe. Penetrations in stairwells shall have flat floor plate painted to match pipe.

2.6 SLEEVES

- A. General: All openings through all floors, walls, and roofs, etc., regardless of material for the passage of piping, ductwork, conduit, cable trays, etc., shall be sleeved. All penetrations must pass through sleeves. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Architect/Engineer. If a penetration is cored into an existing vertical solid concrete, masonry or stone structure, then the installation of a sleeve will not be necessary.
 - 1. Sleeve material for floors and exterior walls shall be Schedule 40 galvanized steel with welded water stop rings.
 - 2. Sleeves through interior walls to be galvanized sheetmetal with gauge as required by wall fire rating, 20 gauge minimum.
- B. The minimum clearance between horizontal penetrations including insulation where applicable, and sleeve shall be 1/4", except that the minimum clearance shall accommodate a Thunderline Link seal closure where piping exits the building, or penetrates a wall below ground level. Contractor shall be responsible for the accurate location of penetrations in the slab for his pipe, duct, etc. All penetrations shall be of ample size to accommodate the pipe, duct, etc., plus any specified insulation. Void between sleeve and pipe in interior penetrations shall be filled with Nelson Flameseal Firestop or approved equal caulk or putty.

- C. Floor sleeves shall extend above the finished floor as detailed on the drawings, except that floor sleeves in stairwells shall be flush with the finished floor. Sleeves in walls shall be trimmed flush with wall surface. Refer to the details on the project drawings. Where the details differ from these specifications, the drawings take precedence.
- D. Sleeves for penetrations passing through walls or floors on or below grade shall be removed, if practical, and after the pipes have been installed, the void space around the pipe shall be caulked with a suitable material to effect a waterproof penetration. Note that the practicality of the removal of the sleeve shall be the decision of the Construction Inspector. The decision of the Inspector shall be final.
- E. Vermin proofing: The open space around all ductwork, piping, etc., passing through the ground floor and/or exterior walls shall be vermin proofed in a manner acceptable to the Architect/Engineer.
- F. Waterproofing: The annular space between a pipe and its sleeve in interior floors shall be filled with polyurethane foam rods 50 percent greater in diameter than the space as backing and fill material and made watertight with a permanent elastic polysulfide compound. Seal both surfaces of floor.
- G. Air Plenums: The space around piping, ductwork, etc., passing through air plenums shall be made airtight in a manner acceptable to the Architect/Engineer.
- H. Fireproofing: Seal all cable trays, pipe, conduit, duct, etc., penetrations through roof, fire rated walls and floors with a foam or sealant as described below that will form a watertight, vermin tight barrier that is capable of containing smoke and fire up to 2000° F for two hours. Sealing of cable trays and conduits that extend through rated walls from ends of cable tray shall be done after conductors have been installed. For wet locations, the foam material shall be a silicone RTV foam or an approved equal. For dry locations, a premixed putty equal to Nelson Flameseal Firestop putty may be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 INSERTS

- A. Provide inserts for placement in concrete formwork.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1 1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed, but shall be corrosion protected with galvanized plating. Repair any damaged galvanized plating with a coating of 'Galvalum'.
- L. Hanger Rods: (NOTE: All hanger rods shall be trimmed neatly so that no more than 1 inch of excess hanger rod protrudes beyond the hanger nut. In the event a rod is intentionally but temporarily left excessively long (for sloped or insulated lines for example), the contractor shall take appropriate measures to protect the pipe or other materials from damage.)

3.4 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.5 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors (except in stairwells) two inches above finished floor level. Sleeves through floors shall have welded waterstop rings. Sleeves shall be sealed watertight to floors and pipe.
- D. Where piping, ductwork or conduit penetrates floor, ceiling, or wall, close space between pipe or duct and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers, as appropriate, at both sides of penetration.
- E. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

3.6 PIPE SUPPORT SCHEDULES

STEEL PIPE SIZE Inches	MAX HANGER SPACING Feet	HANGER ROD DIAMETER Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and Over	20	1

3.7 LOW PRESSURE DUCT SUPPORT SCHEDULE:

- A. All horizontal ducts up to and including 40 inches in their greater dimension shall be supported by means of No. 18 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets, or clamps and fastened to above inserts with toggle bolts, beam clamps or other approved means. Duct shall have at least one pair of supports 8' 0" on centers. Clamps shall be used to fasten hangers to reinforcing on sealed ducts.
- B. Horizontal ducts larger than 40 inches in their greatest dimension shall be supported by means of hanger rods bolted to angle iron trapeze hangers. Duct shall have at least one pair of supports 8' 0" on centers according to the following:

Length	Angle	Rod Diameter
4' 0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6' 0"	1-1/2" x 1-1/2" x 1/8"	1/4"
8' 0"	2" x 2" x 1/8"	5/16"
10' 0"	3" x 3" x 1/8"	3/8"

- C. Vertical ducts shall be supported where they pass through the floor lines with 1 1/2" x 1 1/2" x 1/4" angles for ducts up to 60." Above 60", the angles must be increased in strength and sized on an individual basis considering space requirements.

3.8 MEDIUM PRESSURE DUCT SUPPORT SCHEDULE:

- A. All horizontal rectangular ducts shall have duct hanger requirements as follows:

Minimum Hanger Size					
Max Duct Dimen.	Steel Rod	Galvanized Steel Strap Width	Max Spacing	Min # of Hangers	Trapeze Size
0 through 18"	--	1" x 16 ga.	10'	2	--
19" through 36"	--	1" x 16 ga.	10'	2	--
37" through 60"	3/8"	1" x 16 ga.	8'	2	2" x 2" x 1/4"
61" through 120"	3/8"	1-1/2" x 12 ga.	8'	2	2" x 2" x 1/4"
121" through 240"	3/8"	--	4'	3	2-1/2" x 2-1/2" x 3/16"

- B. All horizontal round ducts shall have ducts hangers spaced 10' 0" maximum with requirements as follows:

<u>Duct Diameter</u>	<u>Min. Hanger Size</u>	<u>No. Hangers</u>	<u>Hanger Ring Size</u>
Up through 18"	1" x 16 gauge	1	1" x 16 ga.
19" to 36"	1" x 12 gauge	1	1" X 12 ga.
37" to 50"	1-1/2" x 12 gauge	1	1-1/2" x 12 ga.
51" to 84"	1-1/2" x 12 gauge	2	Support Bracing Angle

3.9 DUCT HANGERS - GENERAL NOTES (ALL PRESSURES)

- A. Hanger straps on duct width of 60 inches and under shall lap under the duct a minimum of 1 inch and have minimum of one fastening screw on the bottom and two on the side.
- B. Hanger straps on duct widths over 60 inches shall be bolted to duct reinforcing with 3/8" bolts minimum.
- C. Use 3/8" minimum bolts for securing duct hanger to band straps.
- D. All round ducts shall be supported within 3 feet of all horizontal or vertical turns.

END OF SECTION 23 05 29

SECTION 23 05 48

VIBRATION ISOLATION

PART 1 - GENERAL

- 1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:
- A. 23 00 00 -- Basic Mechanical Requirements
 - B. 23 05 29 -- Sleeves, Flashings, Supports and Anchors
 - C. 23 05 53 -- Mechanical Identification
- 1.2 WORK INCLUDED
- A. Vibration isolation
 - B. Inertia bases
- 1.3 SCOPE OF WORK:
- A. Furnish and install all labor, materials, equipment tools and service and perform all operations required in connection with or properly incidental to the construction of complete system of vibration and noise control, as indicated on the Drawings, reasonably implied therefrom or as specified herein, unless specifically excluded.
- 1.4 REFERENCES
- A. ASHRAE - Guide to Average Noise Criteria Curves
- 1.5 QUALITY ASSURANCE
- A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition
- 1.6 SUBMITTALS
- A. Submit shop drawings and product data under provisions of Section 23 00 00.
 - B. Indicate inertia bases on shop drawings.
 - C. Indicate vibration isolator locations, with static and dynamic load on each, on shop drawings and described on product data.
 - D. Submit manufacturer's installation instructions under provisions of Section 23 00 00.
- 1.7 CERTIFICATES
- A. Submit a certificate from the manufacturer that isolators are properly installed and properly adjusted to meet or exceed specified requirements.
- 1.8 INTENT OF RESPONSIBILITY:
- A. It is the intent of this specification to provide for vibration isolation supports for all equipment, piping, and ductwork as set out below. The transmission of perceptible vibration, structural borne noise, or objectionable air borne noise to occupied areas by equipment installed under this

contract will not be permitted. The Contractor shall be held responsible for installing the vibration isolators as specified herein or shown on the drawings or otherwise required to prevent the transmission of vibration which would create objectionable noise levels in occupied areas. The isolation supplier must be a firm capable of dealing effectively with vibration and noise characteristics effects and criteria, and one which can provide facilities and capabilities for measuring and evaluating the aforementioned disturbances.

- B. All vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or supplier who will be responsible for adequate coordination of all phases of this work. Concrete housekeeping pads and inertia bases shall be included as part of mechanical work. Pads under electrical gear shall be included as part of electrical work. The concrete work shall meet the requirements specified in the General Contract Specifications.
- C. The Contractor shall furnish complete submittal data, including Shop Drawings, which shall indicate the size, type, and deflection of each isolator; and the supported weight, disturbing frequency, and efficiency of each isolator proposed; and any other information as may be required for the Architects and Engineers to check the isolator selection for compliance with the specification. All steel bases and concrete inertia bases shall be completely detailed, and shall show completely any reinforcing steel that may be required to provide a rigid base for the isolated equipment. Further, the submittal data shall indicate, clearly, outlined procedures for installing and adjusting the isolators and bases mentioned above.

PART 2 - The vibration isolation manufacturer, or his qualified representative, shall be responsible for providing such supervision as may be required to assure correct and complete installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation and before acceptance by the Owner, the isolation manufacturer or his qualified representative, in company with the Architect or his designated representative, shall make a final inspection and submit his report to the Architects and Engineers, in writing, certifying the correctness of the installation and compliance with approved submittal data. Any discrepancies or maladjustments found shall be so noted in the report. Should any noise or vibration be objectionable to the Owner, Architect, or Engineer, a field instrumentation test and measurement must be made to determine the source, cause, and path of any such disturbance. Any variation or noncompliance with these specification requirements is to be corrected by the installing contractor in an approved manner.

PART 3 - PRODUCTS

3.1 MANUFACTURERS:

- A. Vibration isolation devices shall be as manufactured by Vibration Mountings & Controls Inc (VMC), Kinetics Noise Control, or approved equal.

3.2 GENERAL DESIGN FEATURES:

- A. All vibration isolators and bases furnished by the Contractor shall be designed for and treated for resistance to corrosion.
- B. Steel components shall be PVC coated or phosphated and painted with industrial grade enamel. All nuts, bolts and washers shall be zinc-electroplated or cadmium plated. Structural bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer. A finish coat of industrial grade enamel shall be applied over the primer.
- C. All isolators exposed to the weather shall have steel parts PVC coated, hot-dip galvanized, or zinc-electroplated and shall have a coating of Neoprene or Bitumastic paint. Aluminum components for outdoor installation shall be etched and painted with industrial grade enamel.

- D. Required spring deflections for isolators supporting various items of equipment are shown on the Drawings or tabulated elsewhere in these specifications, but in no case shall be less than one inch. The springs shall be capable of 30% over-travel before becoming solid.
- E. Where height-saving brackets for side mounting of isolators are required, the height-saving brackets shall be designed to provide for an operating clearance of 2" under the isolated structure, and designed so that the isolators can be installed and removed when the operating clearance is 2" or less. When used with spring isolators having a deflection of 2-1/2" or more, the height-saving brackets shall be of the pre-compression type to limit exposed bolt length between the top of the isolator and the underneath side of the bracket.
- F. All isolators supporting a given piece of equipment shall limit the length of the exposed adjustment bolt between the top and base to a maximum range of 1" to 2".
- G. All isolators supporting a given piece of equipment shall be selected for approximately equal spring deflection.
- H. Isolators for equipment installed out-of-doors shall be designed to provide adequate restraint due to normal wind conditions and to withstand wind load of 55 PSF (pounds per square foot) applied to any exposed surface of the equipment without failure.

3.3 ISOLATOR TYPES: ISOLATOR TYPES AND REQUIRED DEFLECTIONS ARE SPECIFIED UNDER "SCHEDULE OF ISOLATED EQUIPMENT," PARAGRAPH 3.2. THE ISOLATORS SHALL COMPLY WITH THE FOLLOWING DESCRIPTIONS FOR EACH TYPE REQUIRED ON THE PROJECT:

- A. Type 1 - An adjustable, free-standing, open-spring mounting with combination leveling bolt and equipment fastening bolt. The spring(s) shall be rigidly attached to the mounting base plate and to the spring compression plate. The isolator shall be designed for a minimum Kx/Ky (horizontal to vertical spring rate) of 1.0. A Neoprene pad having a minimum thickness of 1/4" shall be bonded to the base plate. Base plates shall be sized to limit pad loading to 100 psi.
- B. Type 2 - An aluminum-housed, or cast iron housed, adjustable, spring mounting having telescoping top and bottom sections separated by resilient inserts of Neoprene or other suitable material to limit horizontal motion. The inserts shall be permanently lubricated to minimize vertical friction. Sheet or cast iron housings may be used if they are hot-dip galvanized after fabrication. A Neoprene pad having a minimum thickness of 1/4" shall be bonded to the base plate.
- C. Type 3 - An elastomeric mounting having steel base plate with mounting holes and a threaded insert at top of the mounting for attaching equipment. All metal parts shall be completely embedded in the elastomeric materials. The elastomer may be Neoprene or high synthetic rubber with anti-ozone and anti-oxidant additives. Mountings shall be designed for approximately 1/4" deflection and loaded so that deflection does not exceed 15% of the free height of the mounting.
- D. Type 4 - A pad-type mounting consisting of two layers of 3/8" thick, ribbed or waffled, Neoprene pads bonded to a 16 gauge galvanized steel separator plate. Bolting not required. Pads shall be sized for approximately 20 to 40 psi load, or a deflection of 0.10" to 0.16".
- E. Type 5 - A spring hanger consisting of a rectangular steel box, coil springs, spring cups, Neoprene impregnated fabric washer, steel washer, and Neoprene insert designed to prevent metal to metal contact between the hanger rod and bottom of the hanger box. The hanger box shall be capable of supporting a load of 200% of rated load without noticeable deformation or failure.
- F. Type 6 - A spring hanger, as described in Type 5, with the addition of an elastomeric element at the top of the box for acoustic isolation. The design shall be such to prevent metal - to metal

contact between the hanger rod and the top of the hanger box. The elastomeric element shall meet the design requirements for Type 3 mountings.

- G. Type 7 - An elastomeric hanger, consisting of a rectangular steel box and an elastomeric isolation element, which shall be of Neoprene or high quality synthetic rubber with anti-ozone and anti-oxidant additive. The elements shall be so designed for approximately 1/4" deflection and loaded so that deflection does not exceed 15% of the free height of the element. The design shall be such as to prevent metal-to-metal contact between the hanger rod and the steel box.
 - H. Type 8 - 1/4" thick closed cell Neoprene in sheets cut to fit penetrations, as required.
- 3.4 BASE TYPES: BASE TYPES AND REQUIRED DEFLECTIONS ARE SPECIFIED UNDER "SCHEDULE OF ISOLATED EQUIPMENT," PARAGRAPH 3.2, OR ARE INDICATED ON THE DRAWINGS. THE BASES SHALL COMPLY WITH THE FOLLOWING DESCRIPTIONS FOR EACH TYPE REQUIRED ON THE PROJECT.
- A. Type B-1 - A structural steel fan and motor base with motor side rails and holes drilled to receive the fan and motor. The steel members shall be adequately sized to prevent distortion and misalignment of the drive, and specifically shall be sized to limit deflection of the beam on the drive side to 0.05" due to starting torque. Snubbers to prevent excessive motion on starting or stopping shall be furnished, if required; however, the snubbers shall not be engaged under steady running conditions.
 - B. Type B-2 - A concrete inertia base, consisting of a perimeter steel pouring forming, reinforcing bars welded in place, bolting templates, anchor bolts, and height-saving brackets for side mounting of the isolators. The perimeter steel members shall be structural channels having a minimum depth of 1/12 of the longest span, but not less than 6" deep. The inertia base for pumps shall be at least equal in weight to the pump with its driving motor and be sized for a minimum overlap of 4" around the base of the equipment. Concrete inertia bases for pumps shall be sized to support the suction elbow of end suction pumps and both the suction and discharge elbows of horizontal split-case pumps. The bases shall be T-shaped where necessary to conserve space.

PART 4 - EXECUTION

4.1 GENERAL INSTALLATION REQUIREMENTS:

- A. Install vibration isolators for motor driven equipment.
- B. Set steel bases for 1-inch clearance between housekeeping pad and base. Set concrete inertia bases for 2-inch clearance. Adjust equipment level.
- C. Provide spring isolators on piping connected to isolated equipment as follows: Up to 4 inch diameter, first three points of support; 5 to 8 inch diameter, first four points of support; 10 inch diameter and over, first six points of support. Static deflection of first point shall be twice deflection of isolated equipment.
- D. Piping:
 - 1. Floor mounted supports shall have the same type of isolator or media as is used for the nearest isolated equipment connected to the piping.
 - 2. The pipe hanger system shall have provisions for all piping to be shimmed or blocked in place until all connections are made and the system filled with water; then, the isolators adjusted to support the weights, and the shim blocks removed.
 - 3. The first three support points from a piece of isolated equipment shall be of the positioning type and provide not less than the static deflection of the equipment isolators.

4. All springs supporting piping shall be capable of an additional 1/2" deflection prior to complete compression and springs supporting vertical risers shall have provisions for limit stops.

E. Resilient Sleeves:

1. Resilient sleeves shall be provided at all points where equipment room walls, floors, or ceilings are penetrated by ducts, piping, or refrigerant line, etc.

F. VRVs:

1. Such units shall have electrical flexible connections not less than 36" long and the flexible duct connections with a free length of not less than 8".

4.2 SCHEDULE OF ISOLATED EQUIPMENT:

- A. Tabulated below is a schedule of equipment on this project requiring vibration isolation and base isolators of the types listed above. Any equipment, system, construction or condition that may be altered, added, or changed; or that is not specifically considered herein or on the plans shall be treated in a manner that is set out for similar equipment system or construction in order to comply with the above requirements heretofore cited.

END OF SECTION 23 05 48

SECTION 23 05 53

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

- A. Perform all Work required to provide and install Owner's equipment tags, fire damper tags, valve tags, stencils, and pipe markers indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Contractor shall make it possible for Owner's operations and maintenance personnel to readily identify the various pieces of equipment, valves, piping, ductwork, fire dampers etc., by marking them in accordance with this Specification.
- C. Clearly mark all items of equipment, including but not limited to, fans, pumps, fire dampers, and valves using equipment tags as specified in this Section. The tagged item of equipment shall correspond to the same number as shown on the Drawings and as listed in the Equipment Matrix.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Provide manufacturer's catalog literature for each product.
- B. Record Documents:
 - 1. Submit Equipment Matrix with Valve and Fire Damper schedules completed
- C. Operation and Maintenance Data:
 - 1. Manufacturer's Installation Instructions: Indicate special procedures and installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 MANUFACTURERS

- A. Marking Systems, Inc.
- B. Seton Name Plate Company.
- C. Brady Company.
- D. Graphic Products, Inc.

2.3 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.4 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm)
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.5 EQUIPMENT AND FIRE DAMPER TAGS

- A. Description: 3" x 4" vinyl label, 3.0 Mil self-adhesive vinyl similar to DuraLabel Pro. Label color shall be black text on a white background. The label shall contain the following information per the template, described in Attachment "B":
 - 1. Asset Short Description As listed in Equipment Matrix.
 - 2. Asset Number: As listed in Equipment Matrix.
 - 3. Asset Location: As listed in Equipment Matrix.
 - 4. Asset Bar Code Number.
 - 5. All scheduled equipment shall be identified with an Equipment Tag.

2.6 PIPE MARKERS

- A. Manufacturers:
- B. Color: Conform to ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Heat sealed or heat shrink, spring fasteners, clips or snap-on are acceptable.
- E. Round Pipe and Duct Markers shall conform to ANSI A13.1-2015 "Scheme for the Identification of Piping Systems", refer to Attachment "A" for abbreviation and label color designations. Arrow markers must have same ANSI background colors as their companion pipe markers or be incorporated into the pipe identification marker.

- F. Rectangular Duct Stencils shall conform to ANSI A13.1-2015 "Scheme for the Identification of Piping Systems", refer to Attachment "B" for abbreviation and label color designations. Letter height shall be a minimum of 1-1/4". Stencil material shall be fiber board; Stencil paint shall be exterior, gloss, acrylic enamel.

2.7 CEILING TACKS

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- B. Color code as follows:
 - 1. Yellow - HVAC equipment
 - 2. Red - Fire dampers/smoke dampers
 - 3. Green - Plumbing valves
 - 4. Blue - Heating/cooling valves

2.8 GENERAL:

- A. The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them. All items of equipment such as fans, pumps, etc., shall be clearly marked using engraved nameplates as hereinafter specified. The item of equipment shall indicate the same number as shown on the Drawings. For example, pumps will be identified as 3A, 3B, 3C, etc.; exhaust fans will be E-1, E-2, etc.; supply fans will be S-1, S-2, etc.

2.9 MECHANICAL:

- A. All items of mechanical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16" thick, 3-ply, with black surfaces and white core. Engraving shall be condensed Gothic, at least 1/2" high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information.

2.10 SPECIALS:

- A. Refer to special requirements noted in the various sections hereinafter bound.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Division 9 for stencil painting.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Division 9.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.

- E. Identify air handling units, Tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify thermostats relating to terminal boxes or valves with nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify air terminal units and radiator valves with numbered tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Provide ceiling tacks to locate valves, dampers or other concealed equipment above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 APPLICATION OF MARKERS AND STENCILS

- A. Piping runs throughout the Project including those above lift-out ceilings, under floor and those exposed to view when access doors or access panels are opened shall be identified by means of pipe markers and/or stencils. Concealed areas, for purposes of this identification section, are those areas that cannot be seen except by demolition of the building elements. In addition to pipe markers and/or stencils, arrow markers shall be used to indicate direction of flow.
- B. As a minimum, locate pipe markers and/or stencils as follows:
 - 1. Provide a pipe marker at each valve to indicate proper identification of pipe contents. Where several valves exist on one (1) header, it is necessary to mark only the header.
 - 2. Every 20 feet in exposed and concealed areas on all piping systems. Provide at least one (1) pipe marker in each room on all piping systems.
 - 3. At each branch or riser take off on piping systems, excluding short takeoffs for fixtures and terminal units.
 - 4. Provide a pipe marker or stencil and an arrow marker at every point of pipe entry or exit where the pipe penetrates a wall, floor, service column or enclosure.
 - 5. At access doors, manholes and similar access points that permit view of concealed piping.
 - 6. Near major equipment items and other points of origination and termination.
- C. Provide an arrow marker with each pipe marker pointing away from the pipe marker to indicate direction of flow.
- D. Provide a double-ended arrow marker when flow can be in either or both directions.
- E. Indicate delivered water temperature on domestic hot water supply and return lines.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Tag automatic controls, instruments and relays. Key to control schematic.
- J. Provide ceiling grid tags to locate valves, fan coil units, dampers or other concealed equipment above T-bar type panel ceilings. Locate in corner of grid closest to equipment.

- K. Identify pipe utilizing copper press fittings with markers stating, "Press-Fit" adjacent to each content identification marker.
- L. Identify medium pressure gas piping (14 inches water column to 5psi) with the statement, "WARNING – ½ to 5psi NATURAL GAS".
- M. Identify right and left nipple and coupling union assemblies with the statement "Right/Left Nipple/Coupling".

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING SERVICES

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS CONTAIN INFORMATION REQUIRED TO FULFILL THE REQUIREMENTS OF THIS SECTION:

- A. 23 00 00 -- Basic Mechanical Requirements
- B. 23 09 23 -- Direct Digital Controls
- C. 23 31 00 -- Ductwork
- D. 23 33 00 -- Ductwork Accessories
- E. 23 34 16 - Fans
- F. 23 36 00 -- Air Terminal Units (VAV)
- G. 23 37 00 -- Air Inlets and Outlets

1.2 SUMMARY

- A. TESTING, ADJUSTING AND BALANCING (TAB) OF THE AIR CONDITIONING SYSTEMS AND RELATED ANCILLARY EQUIPMENT WILL BE PERFORMED BY AN IMPARTIAL, TECHNICALLY QUALIFIED TAB FIRM SELECTED AND EMPLOYED BY THE OWNER, SEPARATE AND APART FROM THE CONSTRUCTION CONTRACT.
- B. The firm shall be capable of performing the services specified at the location of the facility described within the time specified, of preparing and submitting the detailed report of the actual field work performed, and following up the basic work as may be required.

1.3 QUALIFICATIONS

- A. The Firm shall be one which is organized to provide professional services of this specified type in the State of Texas and as a minimum shall have one (1) professional engineer licensed in the State of Texas, with current registration, to perform such professional services. This engineer shall be personally responsible for developing the job site data as required in the test procedures outlined in these Specifications.
- B. The Firm shall have operated a minimum of five (5) years under its current Firm name, and shall be in good standing with the State of Texas, Franchise Tax Board. The firm shall submit their full incorporated name, Charter Number and Taxpayer's I.D. Number for proper verification of the firm's status.
- C. The Firm shall be capable of providing a performance bond, by a bonding company licensed to do business in the State of Texas, if determined by the Owner that such a bond is required. The amount of the bond which may be required shall be equal to the cost of the proposal submitted, or in the case of more than one proposal, the sum of all such proposals and any awarded work in progress.
- D. All personnel used on the job site shall be either professional engineers or certified TAB engineering technicians, who shall have been permanent, full time employees of the firm for a minimum of six (6) months prior to the start of work for this specific project.

- E. The TAB firm shall submit biographical data on the supervising Professional Engineer, the individual proposed who will directly supervise the TAB work, as well as other personnel scheduled to perform the technical work under the contract. It shall also submit a background record of at least five years of specialized experience in the field of air hydronic system balancing, and shall possess properly calibrated instrumentation. The supervisory personnel for the TAB firm shall be registered engineers in the mechanical field.

1.4 REFERENCES

- A. AABC - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Seventh Edition.
- B. ASHRAE - 2015 HVAC Applications Chapter 34: Testing, Adjusting and Balancing.
- C. ANSI/ASHRAE Standard 111-2008 - Practices for Measurement, Testing, Adjusting and Balancing of Buildings, Heating, Ventilation, Air Conditioning and Refrigeration Systems.

1.5 DOCUMENTS

- A. The TAB firm shall, as a requirement of the TAB contract, arrange with the Architect to compile one set of mechanical specifications, all pertinent change orders, addenda and the following:
 - 1. One complete set of Drawings less the structural sheets.
 - 2. One set of mechanical floor plans of the conditioned spaces. These Drawings shall be blue or black on light background reproductions to facilitate marking.
- B. Approved submittal data on equipment installed, and related changes as required to accomplish the test procedures outlined in Paragraphs 1.06 through 1.10 of this Specification will be available through the Construction Inspector.

1.6 RESPONSIBILITIES OF THE TAB FIRM

- A. The TAB personnel shall check, adjust, and balance the components of the air conditioning system which will result in optimal noise, temperature, water flow and airflow conditions in the conditioned spaces of the building while the equipment of the system is operating economically. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents. It is the responsibility of the Mechanical Contractor to place the equipment into service. Variable air volume systems shall be balanced in accordance with AABC Standard, Seventh Edition.
- B. Liaison and Early Inspection:
 - 1. The TAB firm personnel on the job shall act as liaison between the Owner, Architect and Contractor. The following reviews (observations) and tests shall be performed by the TAB Agency:
 - a. During the design for Design Development (DD) and for two (2) Construction Document (CD) design stage submittals, at minimum, and before the documents are finalized, review the mechanical drawings and specifications for balance-ability and provide commentary.
 - b. During construction, at a minimum review HVAC submittals such as: Hydronic Specialties, Direct Digital Controls, HVAC Pumps, Steam and Condensate Piping Specialties, Ductwork, Ductwork Accessories, Fans, VAV and Fan Powered Boxes, Air Inlets and Outlets, Heat Exchangers, Air Handling Units, Terminal Heat Transfer Units,

etc., that pertain to balance-ability and commissioning work. The TAB Consultant shall participate as a member of the Commissioning Team.

- c. Allow for a fixed number of trips to the project site, over and above those required for testing and balancing for inspection of installation of the mechanical piping systems, ductwork, temperature controls mechanical equipment and other component parts of the heating, air conditioning and ventilating systems during the construction stage. These inspections shall be made prior to and/or at the above ceiling inspection. Written commentary will be provided to the Resident Construction Manager (RCM) or Construction Inspector (CI) of each observation.
 - d. Test and inspect one (1) 8" single duct terminal box for performance capability and leakage as described in Section 23 36 00 or 23 36 10. The shipment of the box to the TAB Agency's lab will be at the manufacturer's cost and the test period will be for three (3) weeks (maximum) from receipt of the box. Submittal data will not be approved until box testing passes. If the sample box is rejected for any reason the second test will be at the Contractor's cost and the time allowed will restart when the box is received at the TAB Agency.
 - e. Test and inspect one (1) 8" dual duct box for performance capability and leakage as described in Section 23 36 00. The shipment of the box to the TAB Agency's lab will be at the manufacturer's cost and the test period will be for three (3) weeks (maximum) from receipt of the box. Submittal data will not be approved until box testing passes. If the sample box is rejected for any reason the second test will be at the Contractor's cost and the time allowed will restart when the box is received by the TAB agency.
 - f. Test 10% of the single and dual duct boxes for casing and damper leakage when the shipment arrives at the project site. All testing (except for the initial boxes) shall be performed on site. Boxes requiring re-testing will be charged to the Contractor at the unit price provided to the Owner.
 - g. Testing of Air Handling Units (AHU): the TAB Consultant shall witness AHU casing deflection test at the AHU factory and AHU casing leakage testing in the field at the project site.
 - h. Test one (1) lab configuration including fume hood with air valve, general exhaust air with air valve and supply air with air valve for performance capability through a full range of inlet pressures. The tracking capability of the exhaust air versus the supply air will be with the submitted hood sash fully open and as the sash is closed in 2" increments until fully closed. Track the three (3) valves' response time in relation to sash movement and the lab differential.
2. During the balancing process, as abnormalities and malfunctions of equipment or components are discovered by the TAB personnel, the RCM and Construction Inspector shall be advised in writing so that the condition can be corrected by the Mechanical Contractor. The written document need not be formal, but must be clear, complete and legible. Data from malfunctioning equipment shall not be recorded in the final TAB report. The TAB firm shall not instruct or direct the Contractor in any of the work, but will make such reports as are necessary to the Owner.

1.7 FINAL AIR BALANCE

A. General: When systems are complete and ready for operation, the TAB Consultant will perform a final air balance for all air systems and record the results. The supply, return, outside and exhaust air volume for each air handling unit, supply fan and exhaust fan and the supply, exhaust or return air volume for each distribution device shall be adjusted to within +5% of the value shown on the drawings. Air handling unit and fan volumes shall be adjusted by changing fan speed and adjusting volume dampers associated with the unit. Air distribution device volume shall be adjusted using the spin-in tap damper for flexible duct connected devices or the damper-in-duct tap to air device. Air distribution devices shall be balanced with air patterns as specified. Duct volume dampers shall be adjusted to provide air volume to branch ducts where such dampers are shown. The general scope of balancing by the TAB Consultant will include, but is not limited to, the following:

1. Filters: Check air filters and filter media and balance only system with essentially clean filters and filter media. The Division 23 Contractor shall install new filters and filter media prior to the final air balance.
2. Blower Speed: Measure RPM at each fan or blower to design requirements. Where a speed adjustment is required, the Division 23 Contractor shall make any required changes.
3. Ampere Readings: Measure and record full load amperes for motors.
4. Static Pressure: Static pressure gains or losses shall be measured across each supply fan, cooling coil, heating coil, return air fan, air handling unit filter and exhaust fan. These readings shall be measured for this report at the furthest air device or terminal unit from the air handler supplying that device and recorded. Static pressure readings shall also be provided for systems which do not perform as designed.
5. Equipment Air Flow: Adjust and record exhaust, return, outside and supply air CFM (s) and temperatures, as applicable, at each fan, blower and coil.
6. Coil Temperatures: Set controls for full cooling and for full heating loads. Read and record entering and leaving dry bulb and wet bulb temperatures (cooling only) at each cooling coil, heating coil and HVAC terminal unit. At the time of reading record water flow and entering and leaving water temperatures (In variable flow systems adjust the water flow to design for all the above readings).
7. Zone Air Flow: Adjust each zone VAV Terminal Box serving an AHU, each HVAC terminal unit and AHU for design CFM.
8. Outlet Air Flow: Adjust each exhaust inlet and supply diffuser, register and grille to within +5% of design air CFM. Include all terminal points of air supply and all points of exhaust. Note: For Labs and Rooms that are negative exhaust air flow shall be set to design +10% and supply to design -5%. Positive areas will have opposite tolerances.
9. Pitot Tube Traverses: For use in future troubleshooting by maintenance personnel, all exhaust ducts, main supply ducts and return ducts shall have air velocity and volume measured and recorded by the traverse method. Provide a description of locations of these traverse test stations on the sheet containing the data.
10. Maximum and minimum air flow on terminal boxes.

1.8 SOUND VIBRATION AND ALIGNMENT

A. Sound: Read and record sound levels at up to 15 locations in the building designated by the Engineer. All measurements shall be made using an Octave Band Analyzer. All tests shall be conducted when the building is quiet in the presence of the Engineer, if he so desires.

- B. Vibration: Read and record vibration for all water circulating pumps, air handling units, and fans which have motors larger than 10 HP. Include equipment vibration, bearing housing vibration, foundation vibration, building structure vibration, and other tests as directed by the Engineer. Readings will be made using portable IRD (or approved equal) equipment capable of filtering out various unwanted frequencies and standard reporting forms. Maximum vibration at any point listed above, or specified, shall not exceed deflection allowed per Section 23 34 16 for fans and deflection allowed per Section 23 20 00 for pumps unless otherwise specified. Equipment manufacturers shall rectify all systems exceeding vibration tolerances.

1.9 TESTING OF TEMPERATURE CONTROL SYSTEMS

- A. In the process of performing the TAB work, the TAB Agency shall:
1. Work with the temperature control contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding of intended control performance.
 2. Verify that all control devices are properly connected.
 3. Verify that all dampers, valves and other controlled devices are operated by the intended controller.
 4. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).
 5. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions. This includes terminal boxes and fire/smoke dampers.
 6. Observe that all valves are properly installed in the piping system in relation to direction of flow and location.
 7. Observe the calibration of all controllers.
 8. Verify the proper application of all normally opened and normally closed valves.
 9. Observe the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
 10. Observe the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Should an adjustment of the installation be required, the TAB Consultant will provide a recommendation to the RCM and/or CI to coordinate with the Controls subcontractor to resolve as required for proper operation.
 11. Verify that the sequence of operation for any control mode is in accordance with approved shop drawings and specifications. Verify that no simultaneous heating and cooling occurs.
 12. Verify that all controller setpoints meet the design control sequence..
 13. Check all dampers for free travel.
 14. Verify the operation of all interlock systems.
 15. Perform variable volume system verification to assure the system and its components track with changes from full flow to minimum flow.
- B. A systematic listing of the above testing and verification shall be included in the final TAB report.

1.10 REPORTS

- A. The activities described in this section shall culminate in a report to be provided on three (3) CDs and one (1) individually bound printed copy to the RCM. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken after all corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operations personnel.
- B. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the reports must have been made onsite by the permanently employed technicians or Engineers of the firm.
- C. TAB personnel shall submit copies of preliminary field measurements on data sheets tabulated each day to the Commissioning Authority.
- D. Submit reports on forms from the AABC manual approved by the Owner & Engineer which will include the following information as a minimum:
 1. Title Page
 - a. Company Name
 - b. Company Address
 - c. Company telephone number
 - d. Project name
 - e. Project location
 - f. Project Manager
 - g. Project Engineer
 - h. Project Contractor
 2. Instrument List
 - a. Instrument
 - b. Manufacturer
 - c. Model
 - d. Serial Number
 - e. Range
 - f. Calibration date
 - g. What test instrument was used for
 3. Fan Data (Supply and Exhaust)
 - a. Identification/location
 - b. Manufacturer
 - c. Model
 - d. Airflow, specified and actual
 - e. Total static pressure (total external), specified and actual
 - f. Inlet pressure
 - g. Discharge pressure
 - h. Fan RPM
 4. Return Air/Outside Air Data (If fans are used, same data as for 3 above)
 - a. Identification/location
 - b. Design return air flow
 - c. Actual return air flow
 - d. Design outside air flow
 - e. Return air temperature
 - f. Outside air temperature
 - g. Required mixed air temperature
 - h. Actual mixed air temperature

5. Electric Motors
 - a. Manufacturer
 - b. HP/BHP
 - c. Phase, voltage, amperage, nameplate, actual
 - d. RPM
 - e. Service factor
 - f. Starter size, heater elements, rating
6. V-Belt Drive
 - a) Identification/location
 - b) Required driven RPM
 - c) Driven sheave, diameter and RPM
 - d) Belt, size and quantity
 - e) Motor sheave, diameter and RPM
 - f) Center-to-center distance, maximum, minimum and actual
7. Duct Traverse
 - a) System zone/branch/location
 - b) Duct size
 - c) Area
 - d) Design velocity
 - e) Design air flow
 - f) Test velocity
 - g) Test air flow
 - h) Duct static pressure
 - i) Air temperature
 - j) Air correction factor
8. Air Monitoring Station Data
 - a) Identification/location
 - b) System
 - c) Size
 - d) Area
 - e) Design velocity
 - f) Design air flow
 - g) Test velocity
 - h) Test air flow
9. Air Distribution Test Sheet
 - a) Air terminal mark number
 - b) Room number/location
 - c) Terminal type
 - d) Terminal size
 - e) Area factor
 - f) Design velocity
 - g) Design air flow
 - h) Test (final) velocity
 - i) Test (final) air flow
10. Sound Level Report
 - a) Location (Location established by the design engineer)
 - b) NC curve for eight (8) bands - equipment off
 - c) NC curve for eight (8) bands - equipment on
11. Vibration Test on equipment having 10 HP motors or above
 - a) Location of points:

- 1) Fan bearing, drive end
 - 2) Fan bearing, opposite end
 - 3) Motor bearing, center (if applicable)
 - 4) Motor bearing, drive end
 - 5) Motor bearing, opposite end
 - 6) Casing (bottom or top)
 - 7) Casing (side)
 - 8) Duct after flexible connection (discharge)
 - 9) Duct after flexible connection (suction)
 - b) Test readings:
 - 1) Horizontal, velocity and displacement
 - 2) Vertical, velocity and displacement
 - 3) Axial, velocity and displacement
 - c) Normally acceptable readings, velocity and acceleration
 - d) Unusual conditions at time of test
 - e) Vibration source (if non-complying)
12. Control verification indicating date performed and any abnormalities identified.
- a) Point Location/Description
 - b) EMS Readout (Setpoint and Actual)
 - c) Interlocks
 - d) Safeties
 - 1) VFD Normal Operation
 - 2) VFD Bypass Operation
 - e) Alarms
 - f) Sequences of Operation

END OF SECTION 23 05 93

SECTION 23 05 94

SYSTEM PREPARATION FOR TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification
- D. Section 23 05 93 – Testing, Adjusting and Balancing

1.2 SUMMARY

- A. Perform all work required to prepare the building HVAC systems for testing, adjusting and balancing indicated by the Contract Documents as follows:
 - 1. Responsibilities of project contractor
 - 2. Preparation for balancing of air systems
 - 3. Preparation for balancing of hydronic and steam systems
- B. The scope of the TAB work as defined in Section 23 05 93 is indicated in order that the Contractor will be advised of the coordination, adjustment, and system modification which will be required under the project work in order to complete the Owner's requirements for final TAB. The TAB firm will not have a contractual relationship with any Contractor referred to herein, but will be responsible to the Construction Inspector and the Owner for the satisfactory execution of the TAB work. The Contractor in his original bid shall allow for the costs required to cover all work which may be required in the TAB phases as defined herein and as may be necessary for the completion of the TAB work as defined by the TAB firm.

1.3 RELATED SECTIONS

- A. Section 23 05 48 - Vibration Isolation
- B. Section 23 05 93 – System Testing, Adjusting and Balancing
- C. Section 23 31 00 - Ductwork
- D. Section 23 33 00 - Ductwork Accessories
- E. Section 23 34 16 - Fans
- F. Section 23 37 00 - Air Inlets and Outlets

1.4 SCOPE OF WORK

- A. Testing, adjusting, and balancing (TAB) of the air conditioning systems and related ancillary equipment will be performed by an impartial technically qualified TAB firm selected and employed directly by the Owner, separate and apart from the Construction Contract. However, the

preparation for and corrections necessary for the Testing, Adjusting and Balancing of these systems, as described herein, are the responsibility of the Contractor.

- B. As a part of this project Construction Contract, the Contractor shall make any changes or replacements to the sheaves, belts, dampers, valves, etc. required for correct balance as advised by the TAB firm, at no additional cost to the Owner.
- C. The Contractor shall provide and coordinate the services of qualified, responsible Subcontractors, suppliers and personnel as required to correct, repair, and/or replace any and all deficient items or conditions found during the course of this project, including the testing, adjusting and balancing period.
- D. In order that all systems may be properly tested, balanced, and adjusted as required herein by these Specifications, the Contractor shall operate said systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB. This length of time shall be subject to the approval of the Construction Inspector.
- E. Project Contract completion schedules shall allow for sufficient time to permit the completion of TAB services prior to Owner occupancy. The contractor shall allow adequate time for the testing and balancing activities of the owner provided services, during the construction period, and prior to Substantial Completion as defined in the Uniform General Conditions of this Construction Document.
- F. The Drawings and Specifications indicate valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Contractor to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the Contractor shall provide access as requested by the TAB firm. Also, any malfunction encountered by TAB personnel and reported to the Contractor or the Construction Inspector shall be corrected by the Contractor immediately so that the balancing work can proceed with the minimum of delays.

1.5 RESPONSIBILITIES OF THE PROJECT CONTRACTOR:

- A. The Contractor shall:
 - 1. Have the building and air conditioning systems in complete operational readiness for TAB work to begin.
 - 2. The contractor shall allow sufficient time for the TAB firm to perform his contracted work within the construction schedule. The contractor shall complete his work by systems or floors whichever is the most efficient for scheduling. After awarding of the contract and the contractor has developed a construction schedule, a TAB coordination meeting shall be held at the RCM's office with the TAB agency, the general contractor and his primary subcontractors (i.e. mechanical, electrical, building automation etc.) to develop a testing schedule for the project. The contractor shall submit copies of the proposed schedule two (2) weeks prior to this meeting to the RCM and TAB Agency.
 - a. Note: The hot water and chilled water systems must be 100% complete to balance. The air systems are pressure independent and can be balanced by floors, risers, systems, etc., but once the total system is complete the total flows and system tracking will require finalization. Lab certification will be performed when the building is 100% operational and balanced.
 - 3. Promptly correct deficiencies of materials and workmanship identified as delaying completion of TAB work.

4. Be responsible for any added costs to the Owner resulting from his failure to have the building and air conditioning systems ready for TAB when scheduled, or from his failure to correct deficiencies promptly.
- B. Complete operational readiness of the building requires that construction status of the building shall permit the closing of doors, windows, ceilings installed, etc., to obtain simulated or projected operating conditions.
- C. Complete operational readiness of the air conditioning systems also requires that the following be accomplished:
1. Air Distribution Systems:
 - a. Verify installation for conformity to design. All supply, return and exhaust ducts terminated and pressure tested for leakage as required by the Specification.
 - b. All volume, smoke and fire/smoke dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return and relief air shall provide tight closure and full opening, smooth and free operation. All manual volume dampers shall be set in the full open position prior to starting TAB.
 - c. All supply, return, exhaust and transfer grilles, registers, diffusers and terminal devices installed.
 - d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be blanked and/or sealed to eliminate excessive bypass or leakage of air.
 - e. All fans (supply, return and exhaust) operating and verified for freedom from vibration, proper fan rotation and belt tension; heater elements in motor starters to be of proper size and rating; record motor amperage and voltage on each phase at start-up and running, and verify they do not exceed nameplate ratings.
 - f. All single and/or double duct variable and constant volume terminal units ("mixing boxes") shall be installed and functional (i.e. controls functioning).
 2. Automatic Controls:
 - a. The Contractor shall schedule a meeting with the Engineer, Control Contractor, TAB firm and Owner's representative for a pre-submittal review to establish that their interpretations of the sequences of operation are correct.
 - b. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, dampers sequences, air and water resets, fire and freeze stats, high and low temperature thermostats, safeties, etc.
 - c. Verify that all controlling instruments are calibrated and set for design operating conditions with the exception of room thermostats or sensors, which shall be calibrated at the completion of TAB services with cooperation between the TAB firm and Control Contractor.
 - d. The Automatic Temperature Control Contractor and/or Energy Management System Contractor shall thoroughly check all controls, sensors, operators, sequences, etc. before notifying the TAB agency that the Automatic Temperature Controls and Energy Management System are operational. The Automatic Temperature Contractor and/or Energy Management System Contractor shall provide technical

support (technicians and necessary computers) to the TAB agency for a complete check of these systems.

3. Tabulated Data: The motor amperages, voltages shall be recorded showing "actual" and "nameplate" voltage and amperage and submitted and actual RPM. This applies to each piece of electrically driven air conditioning equipment in the system including supply and exhaust fans, fans of fractional horsepower, pumps, etc.

D. Notification of System Readiness:

1. After completion of the work in Paragraph 1.5A through C above, the Contractor shall notify the Owner in writing, certifying that the work has been accomplished and that the building and the air conditioning systems are in operational readiness for testing, adjusting, and balancing. The Contractor shall include a copy of the tabulated data of Paragraph 1.5 C.4 above.
2. The Owner will, in turn, notify the TAB firm of the readiness for balancing and forward copies of the Contractor's certification and the tabulated voltages and currents.
3. Should the TAB firm be notified as described above, and the TAB work commenced and the systems are found NOT to be in readiness or a dispute occurs as to the readiness of the systems, the Contractor shall request an inspection be made by duly appointed representative of the Owner, Architect, TAB firm and the Contractor. This inspection will establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the TAB services notification to have been premature, all cost of the inspection and wasted work accomplished by the TAB firm shall be reimbursed to the appropriated parties by the Project Contractor.

1.6 RESPONSIBILITIES OF THE TAB FIRM

- A. Refer to Section 23 05 93 entitled "System Testing, Adjusting and Balancing."

END OF SECTION 23 09 23.A

SECTION 23 07 13 DUCTWORK INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. SUMMARY
- C. Perform all Work required to provide and install ductwork insulation and jackets indicated by the Contract Documents with supplementary items necessary for proper installation.

1.02 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.
 - 3. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 4. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 5. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
 - 6. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - 7. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
 - 8. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 9. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 10. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - 11. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 12. ASTM E96 - Water Vapor Transmission of Materials.

13. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
14. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
15. NFPA 255 - Surface Burning Characteristics of Building Materials.
16. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
17. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.
18. UL 723 - Surface Burning Characteristics of Building Materials.
19. ASTM E2336 - Standard for Grease Ducts.
20. ASTM D5590 - - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.03 QUALITY ASSURANCE

- A. All ductwork requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.
- B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.
- C. Application Company Qualifications: Company performing the Work of this Section must have minimum three (3) years experience specializing in the trade.
- D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.
- E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unightly, inadequate, or sloppy Work will not be acceptable.

1.04 SUBMITTALS

- A. Product Data:
 1. Provide product description, list of materials, "k" value, "R" value, mean temperature range, and thickness for each service and location.
- B. Record Documents:
 1. Submit under provisions of Division 01.
- C. Operation and Maintenance Data:

1. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.
2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products to the Project Site under provisions of Division 01 and Division 20.
- B. Deliver materials to Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.
- D. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

- A. CertainTeed Corporation.
- B. Johns Manville Corporation.
- C. Knauf Corporation.
- D. Owens-Corning.
- E. Armacell North America.
- F. Unifrax 1 LLC. (FyreWrap)
- G. 3M Fire Protection Products (Fire Barrier Duct Wrap 615+)

2.03 INSULATION MATERIALS

- A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.
- B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.
- C. Type D3: Ductliner (to be used in return air sound boots and as noted on drawings), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable acrylic surface coating specifically formulated to:

1. Be no more corrosive than sterile cotton when tested in accordance with the test method for corrosiveness in ASTM C665.
 2. Absorb no more than 3 percent by weight when tested in accordance with the test method for moisture vapor sorption in ASTM C1104.
 3. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM C1071, ASTM C1338, ASTM G21, and ASTM G22.
 4. Show no signs of warpage, cracking, delaminating, flaming, smoking, glowing, or any other visibly negative changes when tested in accordance with the test method for temperature resistance in ASTM C411.
 5. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
 6. Meet the sound absorption requirements when tested in accordance with the test method for sound absorption in ASTM C423.
 7. Show no evidence of continued erosion, cracking, flaking, peeling, or delamination when tested in accordance with the test method for erosion resistance in UL181.
- D. Type D4: Fire Rated Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000 degrees F; aluminum foil laminated on both sides; with a minimum 'k' value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.
- E. Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); Material that has a service temperature range from -60 degrees F to 180 degrees F. This outdoor duct insulation meets ASTM C 177 or C 518 and shall have minimum 'k' value of 0.25 Btu-in. / hr-ft²- degrees F at minimum density measurement of 3 lb/cu ft. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:
1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.
 2. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
 3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.
 4. Shall have a 10 year warranty against UV light.
- F. INSULATION ACCESSORIES
- G. Weather Barrier: Breather Mastic:, Childers CP-10/CP-11 or Foster 46-50 White..
- H. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.
- I. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

- J. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.
- K. Glass Fiber Insulation
- L. Coating. Foster 30-80 or Childers CP-38 vapor barrier coating. Permeance shall be 0.05 perms or less as tested by ASTM E96, Procedure A at 47 mils dft or 0.08 perms or less as tested by ASTM F1249. Coating must comply with MIL-PRF-19565C, Type II and be QPL listed. When higher humidity levels may be of concern, only specify the following fungus/mold resistant coating: Foster 30-80 AF (anti-fungal). Coating must meet ASTM D 5590 with 0 growth rating
- M. Adhesive. Fosters 85-60 or Childers CP-127 adhesive. Product must comply with ASTM C916 and ASTM E84 25/50 requirements.
- N. Reinforcing Mesh. Fiberglass or polyester, 10 strands by 10 strands per square inch. Similar to Foster Mast A Fab or Childers Chil Glas #10.
- O. Flexible Elastomeric.
 - 1. Adhesive. Armaflex 520 BLV Low VOC Adhesive, Foster 85-75 or Childers CP-82.
- P. Outdoor Insulation
 - 1. Foster 30-90 or Childers CP-35. White
 - 2. Adhesive. Armaflex 520 or Low VOC Spray Adhesive.
 - 3. Armatuff white seal seam tape with same cladding as insulation.
- Q. Fire Rated Insulation Adhesives: Fire resistive to ASTM E84, Childers CP-82 or Foster 85-20.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that ductwork has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.
- C. Maintain required ambient temperature during and after installation for a minimum period of 24 hours.
- D. Where trapeze hangers are used, provide strip of non-compressible insulation between ductwork and hanger.

3.02 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

- D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure diffuser insulation to the top of ceiling diffusers with UL181B-FX listed polypropylene duct tape. Insulate the top of all supply and ducted return ceiling diffusers and uninsulated plenums on slot diffusers and linear bar grilles. Secure flexible ductwork to diffuser neck with reinforcing mesh and vapor barrier.
- E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:
1. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners on 18 inch centers where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Seal insulation around access doors and damper operators to allow operation without disturbing wrapping. Adhesive applied pins are not allowed.
 2. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.
 3. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.
 4. Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.
- F. Duct Liner (Type D3) application for interior of return air sound boots and where noted on drawings:
1. Secure insulation with 100 percent coverage of duct liner adhesive, pins and clips not more than 18 inches on center.
 2. Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.
 3. For round duct, secure insulation with 100 percent coverage of duct liner adhesive. Secure cladding with 3/4 inch, 0.020 inch stainless steel bands on 12-inch centers.
 4. For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.
 5. Insulation (Type D4) application for exterior of grease (or other fire rated) ducts:
 6. External duct wrap system requires two (2) 1.5-inch layers of lightweight, flexible wrap overlapped to provide an effective fire barrier. The barrier is installed in 24-inch or 48-inch wide sections. Insulation pins are welded in certain locations to maintain the fire barrier material up against the duct.
 7. Duct doors to be installed so the door can be removed and re installed and meet code requirements.

8. Install duct wrap as tested per manufacturer's instructions to assure the duct wrap is mechanically attached per the manufacturer's spacing of bands or weld pins.
 9. Vertical and horizontal members of the support hanger system shall be wrapped with one layer of the insulation. Vertical and horizontal portions shall be wrapped independent of one another. The horizontal hanger shall be removed from the vertical support rods and wrapped and then immediately replaced so that an adjacent horizontal support can be removed, wrapped, and reinstalled. The end of the threaded vertical rod shall extend 6-inch past the horizontal member at the beginning of the installation. The Contractor shall coordinate any special manufacturer's hanger requirements for ductwork with fire rated insulation with sheet metal contractor. If hanger rods and angles do not meet manufacture's requirements for fire rating, insulate hanger supports per manufacturer's installation instructions.
 10. Penetrations: Where ducts penetrate fire rated walls, floors and roofs, the duct wrap shall be used in conjunction with a firestop system that is listed by a nationally recognized laboratory and rated for penetration of a rated wall or floor by the fire rated grease duct system used.
- G. Insulation (Type D5) application for outdoor ducts:
1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.
 2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.
- H. All ductwork, accessories, and all plenums including metal and masonry construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.
- I. Flexible ductwork connections to equipment shall not be insulated.
- J. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.
- K. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.
- L. Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste. Use only anti-fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-36AF, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire retardant weather barrier mastic.

- M. All supply ductwork in the Project shall be insulated; all exhaust and fume hood exhaust ductwork shall not be insulated, unless used for energy recovery purposes or noted on drawings or these specifications.
- N. Flexible round ducts shall be factory insulated.

3.03 INSPECTION

- A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.
- B. Where there is evidence of vapor barrier failure or "wet" insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.04 DUCTWORK INSULATION APPLICATION AND THICKNESS SCHEDULE

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	2"
Return Air, Relief Air, and Exhaust Air	Outside of Mechanical Rooms	D1	1"
	Inside of Mechanical Rooms and exposed	D2	1"
Outside Air (Treated and Untreated)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	2"
Duct mounted coils	Inside of Mechanical Rooms	D2	2"
Terminal Unit Heating Coils	All	D1	2"
Supply Air Diffusers	Top of Diffuser	D1	2"
Return Air Diffusers	Top of Diffuser	D1	1"
Supply Air Duct	Outdoor Environment	D5	2"
Return, Exhaust Air Duct	Outdoor Environment	D5	2"
Return Air Sound Boots/Elbows	All	D3	1"

END OF SECTION 23 07 13

SECTION 23 07 16

EQUIPMENT INSULATION

PART 1 - GENERAL

- 1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:
- A. Section 23 00 00 – Basic Mechanical Requirements
 - B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
 - C. Section 23 05 53 – Mechanical Identification
- 1.2 SECTION INCLUDES
- A. Equipment insulation
 - B. Covering
 - C. Breaching insulation
- 1.3 RELATED SECTIONS
- A. Section 09 91 00 - Painting: Painting insulation covering
- 1.4 REFERENCES
- A. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - B. ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus
 - C. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulation Cement
 - D. ASTM C335 – Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
 - E. ASTM C449 – Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
 - F. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - G. ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
 - H. ASTM C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
 - I. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation
 - J. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - K. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation

- L. ASTM C921 – Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
- M. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
- N. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- O. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials
- P. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- Q. UL 723 – Test for Surface Burning Characteristics of Building Materials

1.5 SUBMITTALS

- A. Submit under provisions of Section 23 00 00.
- B. Product Data: Provide product description, list of materials and thickness for equipment scheduled.
- C. Samples: Submit two samples of any representative size illustrating each insulation type.
- D. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723/ASTM E84.

1.7 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise noted, equipment shall be insulated with same insulation type and thickness as is used for piping which equipment serves.

2.2 TYPE A: HIGH TEMPERATURE FIBERGLASS

- A. ESLIN EG-SCUI or equal glass fiber insulation piping insulation with a "K" factor of 0.30 BTU-In/Hr.-degree F at 200°F and 0.48 BTU-In/Hr.-degree F at 600°.
 1. Rated maximum service temperature of 1200°F (650°C).
 2. Maximum density of 12.5 lbs/ft³
 3. Compressive strength of 28.5 psi minimum when tested in accordance with ASTM C165.
 4. Rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84, UL 723, CAN/ULC-S102-M88 or NFPA 255.
 5. Certified to meet the requirements of ASTM C795 for use over stainless steel.
 6. Rated as noncombustible when tested in accordance with ASTM E136.
 7. Insulation treated with water resistant resin on the surface and within each layer of the insulation
 8. Thickness of insulation shall be sufficient to reduce the surface temperature to the maximum permitted by OSHA and other governing criteria, but in no case more than 150 degrees F.

2.3 TYPE B: FOAM GLASS

- A. Foamglas One Insulation with a "K" factor of 0.29 BTU-In/Hr.-degree F at 75°F manufactured by Pittsburgh Corning Corporation and fabricated by a Pittsburgh Corning Corporation-approved fabricator. Water vapor permeability shall be 0.00 perm-in. The insulation shall comply with ASTM C 552 Type II, furnished in half sections up to 36 inches long or segments 18 inches long.
 1. Rated maximum service temperature of 900°F.
 2. Maximum density of 7.3 lbs/ft³
 3. Compressive strength of 90 psi minimum when tested in accordance with ASTM C165.
 4. Rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84, UL 723, CAN/ULC-S102-M88 or NFPA 255.
 5. Certified to meet the requirements of ASTM C795 for use over stainless steel.
 6. Rated as noncombustible when tested in accordance with ASTM E136.
 7. Fitting insulation shall be applied in same manner as pipe application. Refer to piping insulation specification for proper guidance.

2.4 BUILT UP AIR CONDITIONING CASINGS AND DRAIN PANS:

- A. All walls and ceilings in the built up system plenums shall be lined with Micro-Aire M/F Fiberglass ductboard Type 475, 1" thick. Liner shall be applied to the ceilings and walls with quick tacking rubber base adhesive. Liner shall be additionally secured to surfaces with stick clips and washers spaced 16" on centers. Provide No. 6 mountings, ASTM-C-60T sound absorption test method.
- B. Floors of built up system plenums shall be insulated externally (beneath the floor surface) with 2 inch thick Insulation A, or its equivalent (including vapor barrier protection) integrated into the architectural/structural construction, in all instances where plenums may act as drain pans or otherwise collect moisture, or where personnel access is possible. In all other plenums, floors shall be lined as hereinbefore specified for walls and ceilings.

2.5 PROTECTIVE JACKETING

- A. Metal jacketing: Aluminum or stainless steel jacket, 0.016" thick, banded with 3/4" aluminum banding (0.020" thick) using 3 bands per three foot (3') section of covering.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that equipment has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Do not insulate factory insulated equipment.
- C. On exposed equipment, locate insulation and cover seams in least visible locations.
- D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- F. Insulated dual temperature equipment or cold equipment containing fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory applied or field applied.
 - 2. Finish with glass cloth and vapor barrier adhesive.
 - 3. Insulate entire system.
- G. For insulated equipment containing fluids above ambient temperature:
 - 1. The use of asphaltic compounds in higher-than-ambient temperature service is prohibited.
 - 2. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
 - 3. Finish with glass cloth and adhesive.
 - 4. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.
 - 5. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions, including those at equipment, but label the insulation to indicate a concealed flange or union.
- H. Inserts and Shields:
 - 1. Application: Equipment 2 inches diameter or larger.
 - 2. Shields: Galvanized steel between hangers and inserts.
 - 3. Insert location: Between support shield and equipment and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Heavy density insulating material suitable for the planned temperature range.

- I. Finish insulation at supports, protrusions, and interruptions.
- J. For equipment in mechanical equipment rooms or in finished spaces, finish with aluminum jacket.
- K. For exterior applications, provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.
- L. Cover cellular glass and cellular foam insulation with aluminum jacket.
- M. Do not insulate over any nameplate or ASME stamps. Bevel and seal insulation around such.
- N. Install insulation for equipment requiring access for maintenance, repair, or cleaning, in such a manner that it can be easily removed and replaced without damage.
- O. All piping, equipment, ductwork, all plenums including metal and masonry construction, fans, etc., shall be insulated as indicated on the Drawings, as specified herein, and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.
- P. All insulation shall be applied by mechanics skilled in this particular work and regularly engaged in such occupation. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy work will not be acceptable, and all such work shall be removed and replaced as many times as necessary to achieve an acceptable installation.
- Q. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application, and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

All surfaces to be insulated shall be clean and dry before applying the insulation. All sections of molded pipe covering shall be firmly butted together. Where an insulation covering is applied, it shall lap the adjoining section of insulation by at least three inches (3"). Where insulation terminates, it shall be neatly beveled and finished. No insulation shall be applied until the pipe, duct, etc., have been pressure tested and found tight. Piping, flexible connections, flanges, valves, strainers, and unions shall be covered unless specifically noted otherwise. Flexible connections on duct shall not be covered. All materials used shall be fire retardant or nonflammable. Refer to Section 15A.

- R. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.
- S. The handling and installation of all insulation materials shall be performed in strict accordance with the manufacturer's recommendations.

END OF SECTION 23 07 16

SECTION 23 07 19
PIPING INSULATION

PART 1 - GENERAL

1.01 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. 23 00 00 -- Basic Mechanical Requirements
- B. 23 05 29 -- Sleeves, Flashings, Supports and Anchors
- C. 23 05 53 -- Mechanical Identification

1.02 SECTION INCLUDES

- A. Piping insulation
- B. Jackets and accessories

1.03 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- C. Section 22 13 16 - Plumbing Piping: Placement of hangers and hanger inserts.
- D. Section 23 21 00 - Hydronic Piping: Placement of hangers and hanger inserts.

1.04 RELATED SECTIONS

- A. Section 09 91 00 - Painting: Painting Insulation Jacket.

1.05 REFERENCES

- A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.
- C. ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- D. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal
- F. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- G. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- H. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- I. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- J. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

- K. ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.
- L. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- M. ASTM C591 - Rigid Preformed Cellular Urethane Thermal Insulation.
- N. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.
- O. ASTM C640 - Corkboard and Cork Pipe Thermal Insulation.
- P. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- Q. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- R. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).
- S. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- T. ASTM E84 - Surface Burning Characteristics of Building Materials.
- U. ASTM E96 - Water Vapor Transmission of Materials.
- V. NFPA 255 - Surface Burning Characteristics of Building Materials.
- W. UL 723 - Surface Burning Characteristics of Building Materials.

1.06 SUBMITTALS

- A. Submit under provisions of Section 23 00 00.
- B. Product Data: Provide product description, list of materials 'k' value, 'R' value, mean temperature rating, and thickness for each service, and locations.
- C. Samples: When requested, submit two samples of any representative size illustrating each insulation type.
- D. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.07 QUALITY ASSURANCE

- A. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application, and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

- B. All surfaces to be insulated shall be clean and dry before applying the insulation. All sections of molded pipe covering shall be firmly butted together. Where an insulation covering is applied, it shall lap the adjoining section of insulation by at least three inches (3"). Where insulation terminates, it shall be neatly beveled and finished. No insulation shall be applied until the pipe, duct, etc., have been pressure tested and found tight. Piping, flexible connections, flanges, valves, strainers, and unions shall be covered unless specifically noted otherwise. Flexible connections on duct shall not be covered. All materials used shall be fire retardant or nonflammable. Refer to Section 23 00 00.
- C. All piping, equipment, ductwork, all plenums including metal and masonry construction, fans, etc., shall be insulated as indicated on the Drawings, as specified herein, and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.
- D. To be considered, alternate materials shall have equivalent thermal and moisture resistance of the specified materials.

1.08 QUALIFICATIONS

- A. All insulation shall be applied by mechanics skilled in this particular work and regularly engaged in such occupation.
- B. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy work will not be acceptable, and all such work shall be removed and replaced as many times as necessary to achieve an acceptable installation. The company performing the work of this section shall have a minimum of three years experience specializing in the trade.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 23 00 00.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product thermal ratings and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.
- C. All insulation materials to be asbestos free.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Quality: The type of insulation and its installation in accordance with this Section of the Specifications for each service and the application technique shall be as recommended by the manufacturer.
- B. Fire Rating: All insulation shall have a composite (insulation, jacket or facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard, as tested by ASTM E84, NFPA 255, and UL 723, not to exceed:
- C. Flame Spread 25.
- D. Smoke Developed 50.
- E. Accessories: Accessories such as adhesives, mastics, tapes, and cements shall have the same component ratings as listed.
- F. Labels: Label products and their shipping cartons indicating that flame spread and smoke developed ratings do not exceed the above requirements.
- G. Material Table:

Service	Material	Continuous Vapor Barrier
DX piping	Armaflex	No
Domestic Cold	None	No
Domestic Hot	Copper Fiberglass or Phenolic	No
PEX	Armaflex	No
Storm	Fiberglass	Yes
Condensate	Armaflex	Yes

2.02 PLUMBING PIPING INSULATION THICKNESS:

- A. Minimum: Insulation thickness shall not be less than the following:

Equipment Surface (Non-factory Insulated Equipment Cold or Hot Surfaces)	
Condensate drain pans	1"
Piping Surface	
Condensate drain piping (except above drain pans and less than one foot (1') at floor drains)	1"
Roof and overflows drains (underside), horizontal downspouts, underside of drains (including traps) and horizontal	
PEX domestic hot water lines 2" and smaller	1/2"
Copper domestic hot water lines	1"
All exposed lavatory traps, tailpieces hot and cold water supplies	1-1/2"

All otherwise uninsulated pipe exposed to outdoor
temperatures

2-1/2"

2.03 PIPING:

- A. Fiberglass Pipe Insulation: Provide Schuller Micro-Lok AP/AP-T, Owens/Corning ASJ/SSL, Certain-Teed Snap-on ASJ/SSJ or an approved equal pre-formed glass fiber pipe insulation with a white all service jacket/vapor barrier. Glass fiber pipe insulation shall have a K factor of 0.23 at 75° F mean, a jacket tensile strength of 40 pounds per inch of width, a Mullen Burst of 70 psi, a Beach Puncture of 50 ounce inch per inch and a permeability of 0.02 perm. Longitudinal laps on refrigerant suction pipe insulation shall have a factory-applied pressure sensitive tape closure system. Three inch (3") wide factory-supplied pressure sensitive closure strips shall be provided for butt joints.
- B. Fitting Insulation: Provide pre-molded rigid insulation for valves, fittings, flanges, strainers, and unions. Insulation shall be as specified for pipe insulation, except without the all-service jacket, where applicable.
- C. Manufactured Fitting Covers: Provide matching 25/50 rated PVC covers for insulation on valves, fittings, flanges, strainers, and unions. Covers shall be sealed at cover lap joints and at lap joints to adjacent pipe insulation with an approved vapor barrier mastic. All circumferential joints shall be taped with Manville Z-tape or an approved equal. Covers shall be designed to allow strainer removal or flange removal without destruction of the insulation or cover.
- D. Field Fitting Covers: Provide Foster 30-35 Tite-Fit coating or an approved equal set with Foster Mast-A-Fab or equal reinforcing mesh. Color shall be white unless noted otherwise.
- E. PVC Jacketing: Provide pre-rolled protective jacketing where required or specified for protection of the insulation all service jacket. PVC jacketing shall be 30 mil thickness. All joints shall be made by lapping the jacket and sealing with an approved PVC welding adhesive.
- F. Metal Jacketing: Provide 0.016" thick aluminum jacketing where required or specified. 3/4" x 0.015" stainless steel bands and straps shall be provided for banding insulation jacketing.
- G. Elastomeric Insulation: Provide Armstrong Type II "Armaflex" or approved equal closed cell elastomeric insulation. Insulation shall have a K factor of not more than 0.28 Btu/inch per degree F-per hour at 75° F mean temperature and a water vapor permeability of 0.15 perm-inch or less. Insulation shall have a flame spread rating of 25 and a smoke developed rating of 50. Provide manufacturers recommended adhesive (Armstrong 520 or Manville No. 57). Provide two coats of finish on all exterior exposed insulation to protect from UV rays.
- H. Lavatory Piping: Provide Truebro Model #102 or Plumberex PRO-2000 series or equal fully molded, flexible vinyl insulation system for insulating lavatory traps and hot and cold water supplies.
- I. Miscellaneous: Provide all miscellaneous accessories, components and materials required for installation of a complete insulation system.

2.04 TRAPS OVER BREEZEWAY:

- A. Insulation for piping traps located in the breezeway ceiling shall be the same as for roof drain horizontal piping.

- B. Refer to details on the Drawings. The phrase "subject to freezing temperatures" shall be interpreted to mean all areas not within the confines of heated building spaces. The piping running through the breezeway on the first level shall be insulated.

2.05 CONDENSATE DRAIN PIPING:

- A. Condensate drain piping from fan and coil units, coil banks and other items of piping or equipment subject to condensation forming on the surface shall be insulated with a "25-50" rated, closed cell elastomeric thermal insulation. Elastomeric products shall be supplied in a pre-slit tubular form with a pressure sensitive adhesive system for closure and vapor sealing of the longitudinal joint. All elastomeric insulating products shall be guaranteed not to react with copper piping.
- B. Drain piping from mechanical rooms, and other areas potentially receiving chilled water or condensate from air handlers, shall be similarly insulated for a minimum of 15 feet from the floor drains receiving the cold fluid.

2.06 PROTECTIVE JACKETING:

- A. Provide protective jacketing as described elsewhere and on all exterior or exposed piping and piping in mechanical rooms up to 6'0" AFF.
- B. Jacketing and fitting covers shall be .016 aluminum smooth as manufactured by Premetco or Childers. The jacket shall be pre-cut, pre-rolled, and lapped a minimum of two inches (2") in all directions to shed water. The metal shall be secured at each joint with a minimum of one each (1 ea.) $\frac{3}{4}$ " wide .020 aluminum or stainless steel band and seal. The metal jacketing and fitting covers shall be fabricated of 0.016" aluminum or stainless steel with a smooth finish.
- C. In indoor applications, Proto Corp. LoSmoke PVC jacketing and fitting covers may be used. Material shall have 25/50 rating and shall be limited to piping systems operating at 140 degrees or below.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions in the absence of specific instruction herein.
- B. On exposed piping, locate insulation and cover seams in least visible locations, but not higher than at the side of the pipe at the "90°" position, with the seam lapped such that the lap is directed down.
- C. Insulated condensate or drain lines carrying condensate: Vapor barriers are required. The vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

1. Provide vapor barrier jackets, factory applied or field applied.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
 3. Finish with glass cloth and vapor barrier adhesive.
- D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- E. For insulated pipes conveying fluids above ambient temperature:
4. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
 5. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 6. If PVC fitting covers are used they shall have 25/50 rating.
 7. For hot piping conveying fluids 140°F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
 8. For hot piping conveying fluids over 140°F, insulate flanges and unions, including those at equipment, but label the insulation to indicate a concealed flange or union. See 2.04K.

3.03 INSERTS, SUPPORTS AND SHIELDS:

- A. Application: Piping 2 inches diameter or larger for all systems except direct buried.
- B. Shields: Install between pipe hangers or pipe hanger rolls and inserts. Hangers shall be on the outside of the insulation and shall not be in contact with the pipe. Curved metal shields shall be used between the hangers or support points and the bottom of the insulated pipe for Insulated pipes 2" and larger. Curved metal shields shall be designed to limit the bearing stress on the insulation to 35 psi and shall be curved to fit up to mid-perimeter of the insulated pipe. Shields shall be made of galvanized iron, or black iron painted on both sides with two coats of aluminum paint. Required metal shield sizes are as follows:

Nominal IPS	Lengths	
	Metal Thickness of Shield	
up thru 2"	14 gauge	12"
thru 6"	12 gauge	16"
and above	10 gauge	20"

- C. Insert Location: Between support shield and piping and under the finish jacket.
- D. Insert Configuration: Minimum 2" inches longer than length of shield, of same thickness and contour as adjoining insulation; may be factory fabricated.
- E. Insert Material: Heavy density insulating material suitable for the planned temperature range, and the weight of the pipe.
- F. The shields at support points shall be secured with ½" x 0.016" stainless steel bands and seals.
- G. Finish insulation at supports, protrusions, and interruptions.
- H. The application of the protective shields at rack and guide points in tunnels and in central chilling stations shall be as detailed on the accompanying Drawings.
- I. In lieu of the above the following system of support may be used:

1. At the pipe support positions, the insulation and vapor barrier shall be continuous and shall not be punctured by the support. The insulation at the support shall be the full circumference of 5lbs/ft³ Koolphen K Phenolic Foam material to withstand the bearing loads transmitted from the pipe to the support, it shall extend for at least 1" on either side of the support to allow sealing of the joints with the pipe insulation jacket.
2. The load bearing insulation at the support shall be capable of withstanding the maximum static compressive loads generated by pipe supported at the centers shown in Table 1.
 Variations: Pipe loads greater than those generated at the support centers shown in Table 1 shall be referred to the manufacturer to establish the length and density of the insulated support block. The support centers are based on the weight of Sch 80 pipe filled with water and covered with 1" thickness of 2.2 lbs/ft³ standard insulation including FSK/ASJ vapor barrier.

Table 1 K Block Support Centers

Nominal Pipe Size	3/4	1	1 1/4	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24
Max support centers (feet)																
Sch 80 pipe filled with water covered with 1" of Standard Insulation	6.5	6.5	6.5	10	10	10	10	10	14	14	14	20	20	20	20	20
Metal Saddle Gauge (Galvanized Steel)	22	22	22	20	20	20	16	14	14	14	14	14	114	14	14	14
Length of K Block (inches)	6	6	6	6	6	6	6	9	9	9	9	9	9	12	12	12

3. The Insulation at supports shall be a Kooltherm K Block. K Blocks shall be faced with factory applied FSK/ASJ vapor barrier and fitted with a galvanized steel 1800 saddle bonded to the bottom section of the K Block, for all pipe sizes 1 1/2" and larger.
 4. The vapor barrier shall be completed by the use of a FSK/ASJ overlap and factory applied self-seal lap tape and sealed with vapor barrier adhesive.
 5. At all support positions, other than those where the insulated pipe support block is surrounded by a clip or saddle in direct contact with the block, a block designed to accept the loads generated by the pipe shall be presented to the engineer for approval. e.g. Of the type Kooltherm Insulation products K Block. Ref:- Kooltherm sketch 106/2c for use with Roller or flat beam support.
 6. In all cases where roller supports are used the length of the insulation and the wearing plate where fitted shall extend beyond the limits of the pipe movement.
- J. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- K. Where canvas finish is specified, use Arabol lagging adhesive to prevent mildew in securing canvas. Do not use wheat paste. In addition, cover all canvas insulation with a fire retardant coating.

- L. For purpose of definition in this Specification: "concealed" areas are those areas which cannot be seen by the building occupants, and "exposed" areas are all areas which are exposed to view by the building occupants, including under counter and inside cabinet areas, plus all mechanical rooms.
 - M. Self Sealing Lap and butt joints will not be acceptable as the only seal on piping insulation joints. Self Sealing Lap and butt joints may be utilized only if the joints are additionally secured with field applied vapor barrier adhesive (on piping Systems requiring vapor barriers) or staples and field applied adhesive (on piping system which do not require a vapor barrier jacket). Mechanical fasteners shall be used whenever possible to assure permanent installation per the manufacturer's recommendations.
 - N. Insulation minimum thickness shall be as scheduled; however, additional thickness shall be provided to prevent condensation on the cold surfaces and to provide a maximum exterior insulation surface of 140°F on the hot surfaces.
 - O. Special Protection: All insulated piping in the mechanical rooms within 6'-0" of the floor shall be encased in a protective jacket, and where applicable, finish at top with nickel-plated brass flange plate with set screws or end joint sealing butt strips.
 - P. All exposed outdoor piping shall have metal jacket.
 - Q. Fitting insulation shall be applied in same manner as pipe application. Protruding metal parts (such as valve stems) shall be completely sealed off. Fitting cover jacketing shall be equal to Gasco, Pabco or RPR Metals prefabricated fitting covers of 0.016" paper coated aluminum, secured as recommended by the manufacturer.
 - R. Valves, fittings, etc., in congested areas around coil and heat exchanger equipment, etc., shall be insulated by building up fitting segments and pre-molded sections as necessary.
 - S. No pipe supporting device (other than guides or anchors attached directly to the pipe) shall penetrate the insulation.
- 3.04 PAINTING:
- A. All exposed insulation shall be prepared to receive painting specified under Section 09 91 00.
 - B. The pipe primer shall be Pittsburgh Corning Corporation Pittcote 300.

END OF SECTION 23 07 19

SECTION 23 09 23 – BUILDING CONTROLS and AUTOMATION SYSTEMS (BAS)

PART 1 – GENERAL

1.1 DIRECT-DIGITAL CONTROL (DDC) SYSTEM DESCRIPTION

- A. The Controls Contractor shall supply and install a complete Direct Digital Control (DDC) Building Automation System (BAS) as required to accomplish the Sequences of Control for heating, ventilating, air-conditioning and other building-level equipment and systems as described herein.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, equipment and service necessary for a complete and operational DDC BAS pursuant with this specification and as shown on the associated contract drawings.
- B. Coordinate the existing conditions and requirements of all mechanical and electrical equipment that will be controlled by the DDC BAS.
- C. All labor, material, equipment and service not specifically referred to in this specification or on associated drawings that are required to fulfill the functional intent of this specification shall be provided at no additional cost to the Owner.

1.3 DDC SYSTEM REQUIREMENTS

DDC Systems installed under this specification shall strictly adhere to the following characteristics:

- A. Building Automation System (BAS) Direct Digital Controls (DDC) shall consist of native BACnet, microprocessor-based, peer-to-peer, networked, distributed devices utilizing the BACnet communication protocol in an open, interoperable system. The BAS also includes operator interface devices, programming and configuration software applications, DDC input/output devices, non-DDC automatic temperature controls, enclosures and interconnecting conduit and wire.
 - 1. The BACnet operating stack must be embedded directly in every Device at the board level, and in all operator interface software packages.
 - 2. No Gateways, Communication Bridges, Protocol Translators or any other device that translates any proprietary or other communication protocol to the BACnet communication protocol shall be permitted as a part of the BAS installation pursuant with this specification section. Gateways may only be used as required for communication to existing systems or systems installed pursuant with other specification sections.
 - 3. DDC controllers that are not BACnet compliant shall not be acceptable under this specification and are strictly prohibited.
- B. The BAS shall be modular in nature and comprised of a network of stand-alone DDC devices. The System shall be designed and implemented in such a way that it may be expanded in both capacity and functionality through the addition of DDC Devices, sensors, actuators, etc
- C. All BAS controllers shall be tested, certified, clearly stamped and listed by the BACnet Testing Laboratories (BTL).
- D. Program database, data acquisition, and all control sequence logic shall reside in each DDC Device. The Building Level Communication Network (BLCN) shall not be dependent upon connection to a Server or Supervisory Controller for performance of the Sequence of Control as outlined in this specification. Each individual Device shall, to the greatest possible extent, perform its programmed sequence without reliance on the BLCN.
- E. BAS shall be provided with a complete Web enabled operator interface. The Web enabled application shall operate on industry standard PC hardware. Proprietary server hardware or “Black Boxes” will not be acceptable. Third party Web enabled applications are acceptable if they are configured to be indistinguishable from the OWS applications.

- F. The Owner at the Owner's expense shall provide connection to the Internet for the BAS. The LAN connection type and configuration (TCP/IP addressing scheme, etc.) will be information provided to the System Contractor from the Owner, or Owner's representative.
- G. All BAS DDC Devices at all levels shall be fully custom-programmable in the field using the standard Operators Workstation Software. Configurable, canned program application specific controllers will be permitted when it satisfies a particular application.
- H. All BAS DDC Devices shall be capable of updating firmware using software via internet without replacing any hardware, microprocessors or chips.
- I. The BAS shall be capable of sending system alarms and Event Notifications to pagers, and email, and text messages.
- J. Actuation of control devices shall be electronic. Spring return fail-safe actuation shall be provided when loss of property and/or property damage is possible and where specified.
- K. DDC Automatic Temperature Control (ATC) System shall prevent or allow all controlled equipment from simultaneously restarting after a power outage based on engineered sequences. The order in which equipment (or groups of equipment) is started; along with the time delay between starts shall be user-selectable.

1.4 BASIC SYSTEM ARCHITECTURE

- A. The DDC BAS as provided and installed under this specification shall be a complete system from a single manufacturer designed for use on intranets and the internet.
- B. The primary BAS components shall include but not be limited to:
 - 1. Web Server with operating software
 - 2. Operator Workstation Software (B-OWS)
 - 3. Remote Operator Workstation Software (Remote B-OWS)
 - 4. Portable Operator Workstation Software (Portable B-OWS)
 - 5. Building Controllers (B-BC)
 - 6. Advanced Application Controllers (B-AAC)
 - 7. Application Specific Controllers (B-ASC)
- C. Enterprise Level Communication Network (ELCN) shall consist of high-speed BACnet/IP Local Area Network (LAN) and/or Wide Area Network (WAN) to host Operators Workstations (B-OWS), Building Controllers (B-BC), Building Level Communication Networks (BLCN) and Web-Enabled remote connectivity
- D. Building Level Communication Network (BLCN) shall consist of a BACnet internetwork to host field level DDC Controllers
- E. B-BC's shall automatically route BACnet communications to all configured available BACnet networks.
- F. B-OWS and B-BC's shall be fully IT-compatible devices that communicate directly on a TCP/IP Local Area Network (LAN).
 - 1. LAN shall be 10/100Mbps TCP/IP with the following minimum requirements:
 - a. Cable: 10 base-T, UTP-8 wire, category 5e or greater
 - b. Minimum throughput: 10Mbps with the ability to increase to 100Mbps
 - 2. Enterprise Level Communication Network (ELCN) shall provide communication between B-BC's, B-OWS, remote B-OWS and Web Server using a B/IP LAN backbone.

3. B-BC's shall connect directly to the LAN and communicate using B/IP without a TCP/IP Gateway or network server
 4. Owner shall be responsible for providing TCP/IP networking scheme, addressing, etc. It shall be the responsibility of the BAS Contractor to coordinate implementation of the BAS on the Owner's LAN without disruption.
- G. BAS Manufacturer must natively support the following BACnet data links as defined in the ANSI/ASHRAE Standard 135-2008, BACnet:
1. Point-to-Point (PTP)
 2. Master Slave/Token Passing (MS/TP)
 3. Ethernet (ISO 8802-3)
 4. BACnet IP (B/IP)
- H. Field sensors and control devices shall connect to peer-to-peer, fully programmable B-BC, B-AAC & B-ASC as required to achieve the point monitoring and Sequence of Control as specified herein. All devices are to be monitored by a B-OWS. Final control devices are to be electronic.
- I. Each Mechanical System and/or major piece of Mechanical Equipment shall have one (1) dedicated DDC controller with sufficient I/O capacity such that it shall be connected to ALL field devices and sensors associated with that system and/or piece of equipment. Distributed control of one (1) single piece of major mechanical equipment shall not be performed by multiple controllers.
- J. All BAS controllers, sensors and devices shall be UL listed.
1. All BAS controllers and interface devices must be UL 916 Listed
 2. Where required by the local Authority Having Jurisdiction (AHJ), all BAS controllers and interface devices must be UUKL-UL 864 Listed

1.5 MATERIAL FURNISHED UNDER THIS SECTION BUT INSTALLED UNDER OTHER SECTIONS

- A. Provide, supervise and coordinate the installation of components supplied under this Section but installed under other Divisions of the specification
- B. Automatic control valves, thermo-wells, liquid flow switches, and liquid flow sensors are to be installed by Mechanical Contractor.
- C. Automatic control dampers, airflow measuring stations, and duct-mounted airstream sensors and devices to be installed by Mechanical Contractor
- D. Air Terminal Unit (ATU) B-ASC with integral damper operators are to be installed at factory by ATU manufacturer.

1.6 RELATED SECTIONS

Work related to this Section but covered by other Sections include but are not limited to:

- A. "Integrated Automation System Specification"
- B. Division 23 "Heating, Ventilating and Air-Conditioning Specification"
- C. Division 26 "Electrical System Specification" and "Lighting Control Systems"

1.7 QUALITY ASSURANCE

- A. The BAS Contractor shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship provided under this Specification Section.

- B. BAS components shall be manufactured by firms regularly engaged in the manufacture of equipment of the types, sizes and service required.
- C. The BAS Contractor shall be a factory certified contractor specializing and experienced in BAS installations and with experience in networked microprocessor based commercial HVAC, building and enterprise level control systems.
 - 1. BAS Contractor shall maintain a comprehensive service office location within 100 miles of project location prior to bid date and at a minimum until the completion of the warranty period.
- D. The BAS Contractor shall use technicians and application engineers certified by the manufacturer in the installation, configuration, programming and service of the BAS products
- E. The BACnet internetwork shall be based upon the Manufacturer's standard integrated hardware and software product design intent and in accordance with Manufacturer's installation and application documentation.
- F. All new B-ASC, B-AAC, B-BC, B-OWS software and web-server software shall be the products of a single manufacturer.
- G. The completed and operational BAS shall be in compliance with and meet the requirements of all governing bodies, Authorities Having Jurisdiction (AHJ), applicable local or national standards and codes, except where more stringent or detailed requirements are indicated by the Contract Documents, including the requirements set forth in this Specification and the following:
 - 1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - a. ASHRAE 135-2008: BACnet – Building Automation and Control Networking Protocol
 - 2. National Institute of Standards and Technology (NIST)
 - a. NIST IR 6392 Annex B: Profiles of Standard BACnet Devices
 - 3. Underwriters Laboratories (UL)
 - a. UL 916: Energy Management Systems (EMS)
 - b. UUKL-UL 864: Control Units and Accessories for Fire Alarm Systems
 - 4. Institute of Electrical and Electronic Engineers (IEEE)
 - a. IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - 5. Electronics Industries Association (EIA)
 - a. EIA-232: Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 - b. EIA-485: Standard for Electrical Characteristics of Generator and Receivers for Use in Balanced Digital Multi-Point System
 - 6. Federal Communications Commission (FCC)
 - a. Part J: Class "A" Applications

1.8 SYSTEM PERFORMANCE

- A. The system shall conform at a minimum to the following performance standards:
 - 1. Graphics shall display with a minimum of 50 dynamic real-time data points and within 10 seconds of the request

2. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds of being commanded to change.
3. All changes of state or change of analog values shall be transmitted such that no reporting of a value is more than 15 seconds old.
4. The maximum time from when an object goes into alarm to when it is annunciated at the B-OWS shall not exceed 20 seconds. Those points denoted as critical shall be annunciated within 5 seconds.
5. B-BC, B-AAC, & B-ASC shall be able to execute control loops at a selectable frequency at least 1 time every second. The controller shall scan and update the process value and output generated by this calculation at this same frequency at a minimum.
6. All B-OWS on the network shall receive alarms within 5 seconds of each other.
7. No devices utilizing mercury shall be acceptable for any application
8. Unless noted otherwise in these Specifications, the end-to-end accuracy from sensor to operator interface shall be as noted in Table 1.

Table 1 – System Accuracy	
Measured Variable	Reported Accuracy
Space temperature	+/-0.5 deg C (+/-1 deg F) +/-0.5 deg F
Ducted air	+/-1.0 deg C (+/-2 deg F) +/-0.5 deg F
Outside air	+/-1.0 deg C +/- 0.5 deg F
Water temperature	+/-0.5 deg C (+/-1 deg F)
Delta-T	+/-0.15 deg C (+/-0.25 deg F)
Relative humidity	+/-2% RH 10-90% RH
Water flow	+/-2% of actual value
Air flow (terminal)	+/-10% of actual value (Note 1) +/- 5%
Air flow (measuring stations)	+/-2% for calibrated range.
Air pressure (ducts)	+/-25 Pa (+/-0.1 "WG)
Air pressure (space)	+/-3 Pa (+/-0.01 "WG)
Water pressure	+/-1PSI (Note 2)
Electrical Power	±2% of Range (Note 3)
Carbon Monoxide (CO)	+/-5% of Reading
Carbon Dioxide (CO ²)	+/- 50 PPM
Note 1: (10% to100% of scale) (cannot read accurately below 10%)	
Note 2: for both absolute and differential pressure	
Note 3: * not including utility supplied meters	

- a. Overall combined system repeatability of sensors, controllers and readout devices for a particular application shall be plus or minus 2% of full scale of the operating range. Repeatability of overall combined system of sensor, controller and readout device in a control loop application will be plus or minus 5% of full scale of the operating range.
 - b. Long-term electronic drift shall not exceed 0.4% per year.
9. The system provided shall be expandable to at least 200,000 hard points without additional database licensing fees, or replacing any devices, software or wiring provided herein.

10. All components provided as part of this system shall operate under ambient environmental conditions of 0°C (32°F) to 40°C (104°F) dry bulb and 10% to 90% relative humidity, non-condensing as a minimum. Sensors and control elements shall operate under the ambient environmental temperature, pressure, humidity, and vibration conditions encountered for the installed location. B-OWS equipment (hardware only), such as CRTs and printers, shall, unless designated otherwise, operate properly under ambient environmental conditions of 7°C (45°F) to 32°C (90°F) and a relative humidity of 10% to 90%.
11. Networked components of the system shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

1.9 SUBMITTALS

- A. Submit under provisions of and pursuant with the Division 01 Specifications.
- B. All submittals and documentation including complete BAS System Engineering Design Submittal & Drawings, Project Record Documents, Application Engineering Documents and Owner's & Maintenance Manuals shall be submitted electronically in the form of an Adobe Portable Document Format (.pdf). All Control Schematics, Wiring Diagrams, Riser Diagrams, &c. shall be formatted for A3 11" x 17". All other documentation may be formatted for 8.5" x 11".
- C. Submit in writing and so delineated at the beginning of each submittal, known substitutions and deviations from requirements of Contract Documents. Deviation from Contract Documents must be approved by the **UT Health** Energy Management Environmental Controls Systems (EMECS) office prior to submittal.
- D. Complete BAS Engineering Design Submittal & Drawings shall be prepared pursuant with the following guidelines:
 1. Submittal documentation and drawings shall consistently use the same abbreviations, symbols, nomenclature and identifiers. Each control system element shall be assigned a unique identifier pursuant with the Contract Documents
 2. Submittal documentation and drawings shall have at the beginning an Index and Design Drawing Legend.
 - a. Index shall list all design drawings and elements including the drawing number, sheet number, drawing title, etc.
 - b. Legend shall show and describe all symbols, abbreviations and acronyms used on the Design Drawings
- E. Submit the following:
 1. A complete bill of materials of all equipment, controllers, devices and sensors to be provided and/or used indicating unique equipment identifier/tag, unique device/controller identifier/tag, manufacturer and model number.
 2. Riser diagram of Building Level Communication Network (BLCN) and Enterprise Level Communication Network (ELCN) shall outline execution and details of all network cabling, BAS & Network Hardware including the following:
 - a. All BAS/DDC Hardware with controller number, unique identifier/tag, location, equipment and service
 - b. All Network Hardware with unique identifier, location and service
 - c. Network cabling configuration and execution specification
 - d. Location of all cabling termination points and End of Line (EOL) terminators
 - e. Location of all network interface jacks

- f. A separate riser diagram shall be provided for each network segment
3. A schedule of all control valves including the unique equipment identifier/tag, valve size, dimensions and installation/maintenance clearance, model number (including pattern and connections), close-off rating, flow, CV, pressure drop, pressure rating and location. The valve schedule shall also contain actuator selection data supported by calculations of the force required to move, close and seal the valve at design conditions.
4. A schedule of all control dampers. This shall include the unique equipment identifier, unique damper identifier/tag, damper size, pressure drop, blade configuration, orientation and axis of frame, blade rotation, location and selection criteria of actuators, nominal and actual sizes, and manufacturer and model number. The Damper Schedule shall include the AMCA 500-D maximum leakage rate at the operating static-pressure differential.
5. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include for every BAS component including but not limited to the following:
 - a. Operator Workstation (B-OWS)
 - b. Building Controllers (B-BC)
 - c. Advanced Application Controllers (B-AAC)
 - d. Application Specific Controllers (B-ASC)
 - e. Provide a BACnet Protocol Implementation Conformance Statement (PICS) or BIBB table for each BACnet device type in the submittal.
6. Provide shop drawings and/or manufacturer's standard specification submittal data sheets for all associated BAS equipment, sensors and control devices including unique identifier/tag, manufacturer model number and specific accessories, mounting, &c.
7. Sequence of Operation shall be submitted for every piece of equipment being controlled by and/or associated with the BAS. No operational deviation from specified Sequences of Operation as outlined in Contract Documents shall be permitted without prior written approval. Sequences of Operation shall include and conform to the following:
 - a. Refer to equipment and control devices by their specific unique identifiers/tags pursuant with the Contract Documents and BAS Submittal package.
 - b. Clearly represent actual Application Programming methodology and functional control operation. Do not merely provide a copy of Contract Document specified Sequence of Control.
 - c. Include description of functional system operation under normal and failure conditions.
8. BAS Control Schematics and Wiring Diagrams shall be submitted for every piece of equipment being controlled by and/or associated with the BAS. BAS Control Schematics and Wiring Diagrams shall include and conform to the following:
 - a. Control Schematic flow diagram of each system (air, water, gas, & etc.) being controlled showing actual physical configuration and control device/sensor location of all fans, coils, dampers, valves, pumps, heat exchangers, control devices, &c. including each hardware point type, controller and mnemonic.
 - b. Controller termination details showing every controller point termination, type and mnemonic.

- c. Wiring Diagrams of all packaged equipment, motor starters, relay wiring, equipment interlock, safety circuits, & etc. clearly indicating all interconnecting wiring and termination of all conductors and cables including labels of all cables and point mnemonics.
 - d. Control Enclosure details for every enclosure including panel identifier, location, physical layout, dimensions, instrumentation, labels, & etc. Also include detail wiring (I/O, network and power) and power source for each panel, transformer and controller.
- F. Project Record Documents. Upon completion of installation and systems commissioning submit record documents for review. "As-Built" Project Record Documents should include:
- 1. Project Record Application Engineering Drawings shall include all BAS System Engineering Design Submittal with Drawings updated to reflect actual field conditions, architecture and execution
 - 2. Operating & Maintenance (O&M) Manual including:
 - a. Operator's Manual with Manufacturers' complete operating instructions.
 - b. Programming Manual including:
 - 1) Documentation of all project specific Application and DDC programs
 - 2) All necessary system Administrator-Level passwords and/or required access credentials
 - 3) Information required for programming BAS
 - 4) Complete Final Point Schedule including all hardware and software data points and documentation of calibration and configuration values for all Inputs, Outputs, Variables and PID Loops at the conclusion of systems commissioning and functional testing.
 - 5) Routine preventative maintenance procedures, corrective diagnostic troubleshooting procedures and calibration processes
 - 6) Final Bill of Material with all installed parts, manufacturers, manufacturers' part numbers and ordering information
 - 7) A schedule of recommended spare parts with part numbers and supplier
 - c. Complete system database as functional at the conclusion of systems commissioning and functional testing including all graphics and images used by and/or created for BAS on electronic format as accepted by Owner.

1.10 CALIBRATION, COMMISSIONING, DEMONSTRATION AND ACCEPTANCE

- A. Calibration and Commissioning
- 1. As a part of this contract, the BAS Contractor shall fully commission the entire BAS. All commissioning shall be fully documented and all documentation shall be submitted prior to Demonstration and Acceptance testing. Commissioning shall include a "point-to-point" check-out of the following at a minimum:
 - a. Verify that all Temperature Control Panels (TCP), BAS equipment, controllers, devices and sensors are installed and operational according to the specifications, submittals and manufacturer's installation and application instructions
 - b. Test, calibrate and bring on-line every control device
 - c. Calibrate all inputs by comparing the actual site condition with the B-OWS point display.
 - d. Verify all outputs from B-OWS command to observed response of controlled device.

- e. Verify failure response and fail-safe conditions of all devices and safeties
 - f. Each control program shall be fully commissioned and tested for complete design intent compliance and functionality
 - g. Verify overall network performance of BAS for complete design intent compliance and functionality with all devices on-line, communicating and fully-operational
 - h. Subsystems not directly controlled by the BAS but associated with the ATC shall also be fully tested and commissioned as to design intent compliance and functionality
- B. Demonstration and Acceptance
1. As a part of this contract, the BAS Contractor shall demonstrate compliance of the BAS with the contract documents and operational functionality pursuant with the design Sequences of Operation. Using the documented calibration and commissioning test data the Owner and/or his representative shall select, at random, results to be demonstrated. At least 95% of the results demonstrated must perform as specified and documented on commissioning data sheets or the system must be re-calibrated and re-commissioned before being re-tested.
 2. When the Calibration, Commissioning, Demonstration and Acceptance process has been completed and approved by Owner, Contractor shall be provided with signed letter from Owner indicating Acceptance within ten (10) days of approval.

1.11 TRAINING

- A. As a part of this contract, the BAS Contractor shall provide instruction on the adjustment, operation and maintenance of the BAS as installed including all hardware and software provided by a manufacturer-trained, competent application engineer and/or technician with sufficient experience in the installation, programming and operation of the BAS. All training equipment and material shall be provided by this Contractor.
- B. Training shall be scheduled within thirty (30) days of BAS Acceptance and shall consist of a 1-day operational training program for up to 4 operators at the discretion of the owner. A training day shall be defined as an 8-hour day of instruction Monday through Friday during regular working hours, including two (2) 15-minute breaks and excluding lunchtime and travel.
- C. 1 day of on-site training shall cover the entire execution of the complete BAS and components. Training shall be performed on the Owner's ATC/BAS and shall include:
1. Location of all TCP's, Control Enclosures, controllers, devices, sensors, &c.
 2. Equipment Layout
 3. Sequences of Operation
 4. Maintenance and Repair
 5. Troubleshooting
 6. Preventative Maintenance
 7. Sensor Calibration
 8. Proper Use of Service Tools and Materials
- D. At the discretion of the Owner, on-site training and installed system demonstration sessions may be video-taped
- E. Instructor shall provide one (1) copy of training materials for each attendee at the time of the training. Two additional copies of training materials shall be provided to Owner at time of training at the request of the Owner for archival. Training materials shall include:

1. Agenda
2. Defined objectives for each lesson
3. Copies of audio-visuals and/or Power Point Presentations

1.12 WARRANTY, MAINTENANCE, NORMAL AND EMERGENCY SERVICE

- A. BAS manufacturer shall warranty all DDC controllers to be free of defect in material and workmanship under normal operation and expected service as published by the manufacturer in the unit's performance specifications for a period of five (5) years at a minimum.
 1. BAS manufacturer shall warranty all DDC controller on-board integral carbon dioxide (CO₂) sensing elements to be free of defect in material and workmanship under normal operation and expected service as published by the manufacturer in the unit's performance specifications for a period of two (2) years at a minimum
 2. BAS manufacturer shall warranty all DDC controller on-board integral relative humidity (RH) sensing elements to be free of defect in material and workmanship under normal operation and expected service as published by the manufacturer in the unit's performance specifications for a period of one (1) year at a minimum
- B. As a part of this contract, the BAS Contractor shall warranty all other components of the BAS and installation to be free of defects in workmanship and material under normal expected service and use for a period of one (1) year from the date of final acceptance of the BAS by the Owner.
- C. During the installation warranty period the Contractor shall provide all labor and materials required to repair or to replace all items or components that fail due to defects in workmanship or manufacture at no charge or reduction in service to the Owner.
- D. Except in the event of property loss or damage, warranty service shall be provided during regular working hours Monday through Friday at no charge unless otherwise explicitly outlined in the Contract Documents.
 1. Emergency service performed outside of these parameters shall be performed for charge by BAS Contractor according to the provisions set forth in the Contract Documents.

PART 2 – PRODUCTS

2.1 ACCEPTIBLE MANUFACTURERS

- A. Heat Transfer Solutions, Houston - Jake Orlando
- B. Automated Logic
- C. Siemens

2.2 BACnet WEB SERVER

- A. The WEB Server Hardware shall comply with the following:
 1. Operating System: Microsoft Windows Server 2016 Standard Edition
 - a. Where multiple simultaneous user access is not required, hardware platform may alternately be at a minimum Microsoft Windows 10.
 2. Processor: Pentium Quad Core 4 GHz
 3. Memory: 4GB RAM
- B. The WEB Server Database shall comply with the following:

1. Complete controller database of each B-BC, B-AAC, and B-ASC shall reside (at a minimum) within the respective device. The Web Server Hardware may retain and utilize a backup of the database within each device; however, the complete and original database must reside in the B-BC, B-AAC, and B-ASC.
- C. The WEB Server Software shall comply with the following:
1. Provide licensed copy of the Control System WEB Enabled Application Software described in Section 2.4. This license shall allow unlimited isolated systems to be served, and access by an unlimited number of users.
 2. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
 - a. Manufacturer's Standard Software and Firmware licensing agreement shall be executed by Owner in writing prior to software acquisition and/or installation

2.3 WEB ENABLED APPLICATION SOFTWARE

- A. The WEB Enabled Application software and Graphical User Interface (GUI) is to be stored on the WEB hard disk drive server. WEB Enabled Applications that require system graphics to be stored on the client machines will not be acceptable. The application shall support unlimited access by 5 simultaneous clients using standard Web browser such as Internet Explorer.
- B. The WEB enabled application shall perform native BACnet communications directly to all BACnet devices on the BACnet internetwork. Applications that require translation of data, gateways, or mapping of any kind shall not be acceptable.
- C. The WEB Enabled Application shall provide the same methodology as the B-OWS application when viewing the BACnet Internetwork in terms of network architecture, system graphics, calendars, logs, etc. Systems utilizing Web Enabled Applications and Control Operator Workstation Applications of different manufacturer shall implement both applications so that the methodology is the same. Control Systems that utilize different methodology between the WEB Enabled Application and the Control System Operator Workstation Application for network architecture views, system graphic presentation or request, object, schedule or alarm interaction will not be acceptable.
- D. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
- E. Users shall have administrator defined access privileges. Depending on the access privileges assigned, the user shall be able to utilize those features described herein at different levels of interface varying between View only and Modify.
- F. HTML programming shall not be required to create or display system graphics or data on a Web page.
- G. A new point displayed on a B-OWS graphic screen shall appear automatically on the identical graphic screen served by the web-server with no further programming or file transfer required.
- H. The WEB Enabled Application shall support via the Web Browser client the following as it is described in the Control System Operator Workstation Application as a minimum:
 1. Password Protection
 2. Alarming and Event Notification
 3. Weekly, Annual and Special Event Exception Scheduling
 4. Trend Log Graphing, and the capability to export in ASCII and Microsoft Excel format
 5. Runtime Log Information

6. Ability to Manually Override any Database point
7. Ability to Adjust any Setpoint
8. Audit function that tracks all user actions

- I. The WEB Enabled Application shall support via the Web Browser client the following in addition to what is described above:
 1. Color Graphical User Interface capable of standard, advanced, and GGT Graphics and MUI
 - a. All color graphic displays shall be dynamic with current point data automatically updated from the BACnet internetwork to the browser without operator intervention. Manual operator intervention shall use the same methodology as on the B-OWS application.
 - b. Depending upon configured access level; the operator shall be able to manually adjust digital, analog or calculated values in the system, adjust values of control loops, override points or release points to automatic mode.
 2. System Graphic screens developed for the B-OWS shall be the same image file used for the Web Browser Client. Systems, which require special translation or re-export of graphics to accommodate the web domain, will not be accepted. The Web Browser client shall support any System Graphic animation supported by the B-OWS. System Graphic screens on the Web Browser client shall support hypertext links to other location on the Internet or on Intranet sites by specifying the Uniform Resource Locator (URL) for the desired link.
- J. The WEB Enabled Application shall provide the capability to create a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to a defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
- K. The WEB Enabled Application shall include an Audit Trail feature that automatically records the time, date, and user, and action associated with all user changes made via Web Browser clients.
- L. The WEB Enabled Application shall store complete help files describing system configuration, and use of the Browser Client interface, the help files shall be served on-line as part of the Browser Client interface. Creation, storage and serving of custom-made help files by the owner shall be possible, in lieu of the manufacturer's help files.

2.4 OPERATORS WORKSTATION PLATFORM (B-OWS) (I'm guessing that workstation would need be approved by IT)

- A. Provide as specified herein complete all associated Operating System, Operators Workstation Application Software and Third-Party Software Applications preloaded and configured
- B. Local Operators Workstation (B-OWS) shall be PC-based desktop workstation. Common BAS database and graphic files shall be stored on workstation designated and acting as the system server. Workstation Hardware minimum requirements are as follows:
 1. Intel Pentium IV 3 GHz Processor
 2. 2 GB RAM
 3. 10 GB or larger hard disc drive with 12 millisecond access time
 4. 16x DVD+/-RW
 5. 22" Flat Panel LCD Monitor and 128 MB high performance graphics adapter with a minimum resolution performance of at least 1680 x 1050.
 6. Tower case with at least two spare drive slots and 3 spare board slots.

7. At least one (1) Ethernet 10/100 Network Interface Card (NIC)
 8. At least four (4) USB 2.0 ports
 9. Enhanced style keyboard with 101 key layout, 10 function keys, numeric keypad and separate cursor control pads.
 10. Two button mouse with adjustable sensitivity and desk pad.
 11. All necessary cables
 12. A combination surge suppressor/UPS dedicated to this server and printer.
 13. Provide an integral audio tone generator to activate on detection of an alarm. Audio tone shall be capable of being enabled or disabled on operator command.
- C. Remote Operators Workstation (Remote B-OWS) shall be PC-based desktop workstation. Workstation Hardware minimum requirements are as follows:
1. Remote B-OWS shall have the same hardware and software configuration and requirements of the B-OWS
- D. Portable Operators Workstation (Portable B-OWS) shall be notebook computer workstation. Portable Workstation Hardware minimum requirements are as follows: (I assume the laptop would need to be approved by IT)
1. Intel Pentium IV 2 GHz Processor
 2. 1 GB RAM
 3. 10 GB or larger hard disc drive with 12 millisecond access time
 4. 8x DVD+/-RW
 5. 14.1" Flat Panel LCD Monitor and 128 MB high performance graphics adapter with a minimum resolution performance of at least 1280 X 800
 6. At least one (1) Ethernet 10/100 Network Interface Card (NIC)
 7. At least four (4) USB 2.0 ports
 8. 87 key keyboard with touchpad and track stick pointing devices
 9. All necessary cables
 10. Provide an integral audio tone generator to activate on detection of an alarm. Audio tone shall be capable of being enabled or disabled on operator command.
- E. Communications and Protocols
1. B-OWS information access for the control system shall utilize the BACnet protocol only for communication to B-BC's, B-AAC's, B-ASC's and all other BAS DDC controllers
 2. B-OWS shall reside on the same LAN as B-BC's. B-OWS shall as a minimum support point-to-point (PTP) and BACnet/IP physical/data link layer protocols.
 3. The B-OWS specified here may, at the Owner's option, be located remote from the BACnet internetwork. Other than the difference in B-OWS communication speed, the system shall be capable of remote operation via BACnet LAN types with no degradation in application performance.
- F. B-OWS Operating System (OS) Software shall be consistent on all B-OWS hardware platforms provided.
1. The B-OWS hardware platform OS shall be Microsoft Windows XP Professional Service Pack 2 or newer or Microsoft Windows Vista Business

- G. B-OWS Application Software shall be provided and licensed to Owner. Provide latest versions of software available as follows at a minimum:
 - 1. One (1) Copy of Microsoft Office 2007 Basic
 - 2. Adobe Acrobat 9.0 Standard

2.5 CONTROL SYSTEM OPERATORS WORKSTATION APPLICATION SOFTWARE

- A. The B-OWS Software shall be provided, licensed and installed on at least one B-OWS Platform. If more than one Platform is provided a licensed copy of the B-OWS Software shall be provided for every Platform.
- B. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
 - 1. Manufacturer's Standard Software and Firmware licensing agreement shall be executed by Owner in writing prior to software acquisition and/or installation
- C. The B-OWS Software shall be BTL listed as either a B-OWS or B-AWS.
- D. Password Protection
 - 1. Multiple-level password access protection shall be provided.
 - 2. Passwords shall be exactly the same for all software applications provided to communicate with the internetwork.
 - 3. A minimum of 10 levels of access shall be supported with a configurable matrix of operator actions allowed for each access level, broken down into at least 200 possible operator actions
 - 4. A minimum of 50 passwords shall be supported at each B-OWS.
 - 5. Operators will be able to perform only those commands available for their respective passwords.
 - 6. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving B-OWS in an unsupervised logged-in state.
- E. Alarming and Event Notification
 - 1. B-OWS shall utilize BACnet Alarm Events and PICS shall support at a minimum the following BIBBs:
 - a. Alarm and Event – Acknowledge-A (AE-ACK-A)
 - b. Alarm and Event – Notification-A (AE-N-A)
 - c. Alarm and Event – Alarm Summary View-A (AE-AS-A)
 - d. Alarm and Event – View and Modify-A (AE-VM-A)
 - e. Alarm and Event – View Notifications-A (AE-VN-A)
 - 2. B-OWS terminal shall provide audible, visual, and printed means of alarm and event notification
 - 3. System shall provide log of notification messages. Complete Alarm log of all system and operator transactions shall be archived to the hard disk of the system B-OWS.
 - 4. Alarm messages shall be in user-definable text (English or other specified language) and shall be entered either at the B-OWS terminal or via remote communication.
 - 5. An alarm summary shall be available to show all alarms whether including but not limited to whether or not they have been acknowledged.

6. System shall provide ability to prioritize and differentiate communications for at least 20 different levels of alarms
 7. Alarm messages shall be fully customizable in size, content, behavior and sound.
- F. Weekly Annual and Special Event Scheduling
1. B-OWS Software shall utilize BACnet Schedules and PICS shall support at a minimum the following BIBBs:
 - a. Scheduling – Advanced View and Modify-A (SCH-AVM-A)
 2. Provide ability to view and modify the schedule for the calendar week and up to 255 special events in a graphical format. Each calendar day and special event shall provide at least six time/value entries per day.
 3. Provide the ability for the operator to select scheduling for either binary, analog, or multi-state object values.
 4. Provide the ability for the operator to designate days, date ranges, or repeating date patterns as exception schedules.
 5. Provide the capability for the operator to define special or holiday schedules and to link the BACnet schedule to a BACnet calendar, thereby over-riding weekly schedule programming on holidays defined in the BACnet calendar.
 6. There shall be a provision with proper password access to manually override each schedule.
 7. Provide the capability to designate any exception schedule to be “Executed Once” then automatically cleared.
 8. Provide the ability to name each exception schedule with a user defined term to describe each special event.
- G. Trend Log Graphing
1. B-OWS Software shall allow viewing of BACnet Trend Logs and PICS shall support at a minimum the following BIBBs:
 - a. Trending – View-A (T-V-A)
 2. All data points (both hardware and software) system-wide shall be assignable to a historical trending program by gathering configurable historical samples of object data stored in the local controller (B-BC, B-AAC, B-ASC).
 3. All trend log information shall be displayable in text or graphic format. All information shall be able to be printed in black & white or color and exported directly to a Microsoft Excel Spreadsheet.
 4. Long-term archives shall be automatically stored on the B-OWS platform or automatically stored onto a dedicated machine or server using an SQL database data acquisition service. The B-OWS and/or SQL Database Application shall perform the following at a minimum:
 - a. Be capable of automatically retrieving any trend-log from any device on the network without user-intervention
 - b. Manage connection to internetwork automatically based upon configurable data acquisition thresholds; retrieving data only when necessary rather than streaming data
 - c. Generate standard, secure SQL database accessible by third-party applications
 - d. Shall operate as a Microsoft Windows service
 - e. Archived data shall be limited only by SQL license and hard disk space available

- f. Be capable of exporting data directly to Microsoft Excel
 - g. Not require a separate "viewer" but shall seamlessly present all archived data together with real-time data stored in device using the standard B-OWS Trend Log Viewer.
- H. Runtime Log Information
- 1. 1. B-OWS Software shall be capable of displaying Runtime and On/Off Cycle data of all Binary data points (both hardware and software) system-wide. Runtime logs shall provide the following at a minimum:
 - a. Total Accumulated Runtime
 - b. Accumulated Starts Today
 - c. Total Accumulated Starts
 - d. Timestamp each Start/Stop and duration of each on/off cycle
 - e. Monitor equipment status and generate maintenance messages based upon user designated run time
- I. System Configuration, Set-Up and Definition.
- 1. Device and network status shall be displayed for any device on the BACnet internetwork. At a minimum the following Device Management BIBBs shall be supported:
 - a. Device Management – Automatic Device Mapping-A (DM-ADM-A)
 - b. Device Management – Automatic Network Mapping-A (DM-ANM-A)
 - c. Device Management – Reinitialize Device-A (DM-RD-A)
 - 2. All control strategies and energy management routines shall be stored in the controller and shall allow modification and additions by the operator using the B-OWS software. No strategies or routines shall be stored on the B-OWS platform.
 - 3. B-OWS Software shall have the capability to back-up and restore the programming and database of any BACnet device on the BACnet internetwork. The B-OWS BTL listing shall support the Device Management – Backup and Restore-A (DM-BR-A) BIBB.
 - 4. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system.
- J. Graphical User Interface (GUI)
- 1. B-OWS Software shall support at a minimum BMP, GIF, TIF, JPG, EMF, PNG, SWF and DIB graphic file formats and allow for the use of custom Flash animation objects and URL hyperlinks in every GUI
 - 2. B-OWS Software shall provide a color graphics package to allow the user to generate custom dynamic graphics for graphical representation of system design and system parameters. Graphic images may reside on the B-OWS or server; however, all dynamic data and attributes must reside in the controller.
 - a. A listed set of symbols and graphic slides shall be available to allow operators to select from the graphics table to assist in graphic generation.
 - b. All color graphic displays shall be dynamic with current point data automatically updated from the BACnet internetwork to the B-OWS workstation without operator intervention.
 - c. The operator shall be able to manually adjust all data point values (hardware or software) in the system, adjust values of control loops, and command points to local mode or release points to automatic mode.

- d. The windowing environment of the B-OWS shall allow the user to simultaneously view several graphics at the same time to analyze total building operation, and/or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
 - e. Pre-packaged animations for display of fans, pumps, dampers, etc., and shall allow custom user-created .swf and .gif animations to be used to display objects on graphic displays.
- K. BAS shall be provided with fully automatic diagnostic procedures for verification of internetwork communication. In the event of communications failure, the system shall automatically Alarm the condition. B-OWS Software shall be capable of remote annunciation to printer, pager and e-mail
- L. Control Summaries, Reports and Logging:
- 1. The system shall provide self-documentation reporting to summarize control strategies for any point or any user selected group of points within the Control System.
 - 2. The B-OWS reporting package shall allow the user to configure the point information display in custom format.
 - 3. The B-OWS shall enable operator to perform Wild Card data point sorting and searches
 - 4. The B-OWS shall perform automated network back-up of runtime databases in all devices on the BACnet network according to operator configurable schedule and storage directory structure

2.6 BUILDING CONTROLLERS (B-BC)

- A. B-BC shall comply with all aforementioned BAS System Requirements and shall comply with the BACnet profile for Building Controllers (B-BC)
- B. Furnish B-BC(s) as necessary to control large point count major mechanical equipment, and execution of BAS global strategies, and as noted in the execution portion of this specification.
 - 1. Each Mechanical System and/or major piece of Mechanical Equipment (e.g., Chilled Water, Heating Water, Large AHU, etc.) shall have one (1) dedicated DDC controller with sufficient I/O capacity such that it shall be connected to ALL field devices and sensors associated with that system and/or piece of equipment. Distributed control of one (1) single piece of major mechanical equipment shall not be performed by multiple controllers.
 - 2. Each B-BC shall support local hardware Inputs and Outputs (I/O) by the use of on-board I/O and/or I/O expansion modules.
- C. B-BC shall be capable of locally executing global strategies for the BAS based on information from any object in the internetwork. Control Systems that require a higher-level host processor for update, time stamps, global point data, COS transfer, on-line control instruction, or communications control between B-BC panels shall not be acceptable.
- D. BAS shall communicate with all B-OWS, B-BC, B-AAC & B-ASC on a peer-to-peer basis, and shall provide real-time clock functions for scheduling and network-wide time synchronization
- E. B-BC shall have sufficient memory to support its operating system, database, and programming requirements. Battery/capacitor shall retain static RAM memory and clock functions for a minimum of 72 hours.
 - 1. B-BC operating system, field database, and application programs shall reside in EEPROM.
 - 2. B-BC run-time field database and application programs shall reside in battery backed-up on-board memory or EEPROM.
- F. B-BC shall comply with the following Hardware Configuration:

1. B-BC shall have integral power switch. If the device manufacturer provides no on-board switch then the System Contractor shall provide a separate dedicated transformer and switch within each enclosure for each controller present
 2. B-BC shall provide diagnostic LEDs for power, communications and processor status. The B-BC shall continually check the status of its processor and memory circuits
 3. Controller wiring terminals shall be removable terminal strips for ease of installation and service replacement
 4. All hardware inputs shall be Universal (i.e., binary or analog) configured on hardware and/or in software.
 - a. Inputs shall accept dry-contact, thermistor, 4-20 mA, and 0-5VDC
 - b. Pulse accumulation shall accommodate a maximum frequency of 40Hz
 - c. Inputs shall have a minimum 10 Bit A/D conversion resolution
 - d. 24VAC over-voltage protection
 - e. Proportional voltage/brightness status LED indicators for each input
 5. All hardware outputs shall be Universal and configured on hardware and/or in software.
 - a. Outputs shall provide configurable modulating voltage signal to industry standard 0-5VDC and 0-10VDC analog control devices and relays
 - b. Outputs shall be capable of sourcing 75mA at 12VDC
 - c. Outputs shall have a minimum 8 Bit D/A conversion resolution
 - d. 24VAC over-voltage and short protection
 - e. On-board integral physical Hand-Off-Auto (H-O-A) Switch for every output. H-O-A switch position shall be monitored and displayed by B-BC.
 - 1) In addition to H-O-A switch, Universal Outputs shall be provided with on-board integral potentiometer for manual adjustment of analog modulating voltage signal in conjunction with the Hand position
 - f. Proportional voltage/brightness status LED indicator for each output
- G. B-BC shall interact with the Control System Application Software in compliance with the following:
1. Database programming, configuration and modification shall be accomplished through the B-OWS online with the B-BC. The complete database and application program shall reside in the B-BC. The System Contractor shall configure the software to attain the proper sequence of control and to accomplish all other control system functions indicated in the Contract Documents.
 2. The B-BC shall function in a real-time, multi-tasking networked operating environment; able to display database values, programs, and control loops in real-time while functional and online using the B-OWS. The user shall be able to add, delete, or modify objects on-line as required without taking the B-BC offline. The programming shall provide all the necessary mathematics, logic, utility and control functions necessary to execute the specified sequence of control.
 3. All required application programming shall be resident in the B-BC, B-AAC & B-ASC, and third party BACnet devices, and not in the B-OWS.
 4. B-BC shall manage system-wide alarms by performing distributed, independent alarm analysis and filtering. At no time shall the B-BC panel's ability to report alarms be affected by either operator activity at a B-OWS or local I/O device, or communications with other B-BC on the network.

- a. B-BCs shall have capability to broadcast alarm conditions automatically across the BLCN. Alarm Event notifications shall be sent to off-site computer or serial printer. A minimum of one B-BC per site shall be capable of sending SMTP email messages to an email server for configured alarm conditions.
 - b. Active Alarm Events log shall be stored on the B-BC and may be viewed locally or remotely.
 - c. All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.
 - d. The user shall be able to define the specific system reaction for each point alarm and shall be able to customize reaction and filtering to minimize nuisance reporting. Each B-BC panel shall automatically inhibit the reporting of selected alarms during the standby power modes of operation, loss of power, fire alarm mode, and normal system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
 - e. Alarm reports, messages, and files can be directed to a user-defined list of operator devices, or PCs used for archiving alarm information.
5. B-BC shall perform and manage historical data collection. Minimum sampling time shall be configurable with a minimum sample rate of once per second.
- a. B-BC panels shall store point history files for all analog and binary inputs and outputs.
 - b. Measured and calculated analog and binary data shall also be assignable to user-definable trends.
 - c. Up to six points of any type can be assigned to a single trend log
 - d. Trend data shall be stored at the stand-alone B-BC panels, and uploaded to hard disk storage automatically at preconfigured intervals when archival is desired. Separate archival application software will be accepted.
6. Stand-alone B-BC panels shall automatically accumulate and store runtime hours for binary input and output points.
7. B-BC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.
8. B-BC panels shall have the ability to count and/or execute events on a daily, weekly, or monthly basis.
- H. Communication and Protocols
1. The B-BC shall continuously scan the BACnet network and maintain a current database of field data in on board battery/capacitor backed RAM or EEPROM, including alarms, passwords, binding tables, device status, etc. The B-BC shall communicate with BACnet devices on the BLCN using the BACnet physical data link MS/TP at a baud rate of 76.8 Kbps where not limited by third party BACnet devices such as drives, utility meters, etc.
 2. The B-BC shall provide a communications port for connection of the Portable Operators Terminal using Point-to-Point BACnet physical data link layer protocol or a connection to the network using BACnet/IP.
 3. B-BC shall support and be capable of monitoring and controlling a network of communicating remote space sensors. These networked sensors shall not consume input/output hardware points in the B-BC.
 4. Provide all functions that will allow remote communications via modem to off-site locations. Include modem along with all cabling necessary for installation.

5. B-BC shall support at a minimum of two (2) distinct dedicated BACnet/IP (B/IP) data link networks using TCP/IP and one (1) BACnet/Ethernet data link network simultaneously
6. B-BC shall support integral communication using Modbus RTU and TCP protocols as both a Slave and Master for building systems third-party integration.
7. B-BC shall support SMTP and provide stand-alone remote annunciation of alarms via e-mail without additional hardware, B-OWS, or web-server.
8. B-BC shall support, transmit, and receive of segmented messages.

2.7 ADVANCED APPLICATION CONTROLLERS (B-AAC)

- A. B-AAC shall comply with all aforementioned BAS System Requirements and shall comply with or exceed the BACnet profile for Advanced Application Controllers (B-AAC).
- B. Furnish one dedicated B-AAC(s) for each small or medium sized mechanical system, as noted in the execution portion of this specification. Each B-AAC shall acquire, process, and store point input data on a real time basis for internal use and for sharing with other controllers. Each B-AAC shall also maintain and supervise digital and analog output signals to the control devices and have a real time operating system capable of time of day scheduling and other time-based functions.
 1. If the hardware point requirements of any medium-sized system should exceed the I/O configuration of available B-AAC offerings then a B-BC must be used. Control of one piece of mechanical equipment may not be performed by more than one controller.
- C. B-AAC shall provide microprocessor based self-contained stand-alone fully programmable operation of local process control loops. All local level application programs shall be installed on individual controllers in non-volatile memory.
- D. Each B-AAC shall be capable of sharing point information with other B-BC, B-AAC, or B-ASC on a peer-to-peer basis via the BACnet BLCN.
- E. Control systems that utilize 'canned' programs or programmable read only memory (PROM) level application programming are not acceptable.
- F. Once downloaded, a B-AAC shall not require further communication with the B-OWS except for data base changes, operator commands, and requests from the B-OWS for B-AAC data. Programming of B-AACs shall be completely modifiable in the field, over the installed BACnet network or remotely via the internet.
- G. Each B-AAC shall be provided with the ability to prevent unauthorized access to its software program.
- H. B-AAC shall have sufficient memory to support its operating system, database, and programming requirements.
 1. B-AAC operating system, field database, and application programs shall reside in EEPROM.
- I. B-AAC run-time field database and application programs shall reside in on-board memory or EEPROM.
- J. B-AAC shall feature real-time 24-hour clock and 365-day calendar. Battery or capacitor back-up of these functions is required where the B-AAC is installed as a standalone controller.
- K. B-AAC shall be designed for wall-mounting to a single or double-device box in the space
- L. B-AAC shall include on-board integral LCD User Interface for display and modification of local and/or networked BAS data points as follows:
 1. LCD screen shall be a minimum of 128 x 64 pixels in a viewable area no smaller than 62mm x 44mm (2.4" x 1.7")

2. LCD screen shall feature back-lighting configurable for constantly lit or user-defined time out periods with user-adjustable contrast
 3. B-AAC shall feature push-buttons on the face of the controller for user navigation of the local display screens and for entering values and overriding points.
 4. LCD interface shall be capable of displaying and acknowledging local Alarms
 5. LCD interface shall provide as a minimum eight (8) configurable display screens each capable of displaying a minimum of six (6) local and/or networked data points
 - a. All displayed data points shall be configurable as display only or capable of being modified via the interface
 - b. Display shall support at a minimum three (3) user-defined password-protected security permission levels restricting read/write privileges of all displayed data points
 - c. Ability to edit the annual and weekly schedules from the display
- M. B-AAC shall feature a software configurable audible enunciator which shall be configured to trigger on the occurrence of selected alarms, and shall be audible and acknowledgeable either to all users, or only to those users with sufficient password authority.
- N. B-AAC shall comply with the following Hardware Configuration:
1. B-AAC shall provide diagnostic LEDs for power, communications and processor status. The B-AAC shall continually check the status of its processor and memory circuits
 2. Universal field device hardware inputs shall be provided and configured on hardware and/or in software and comply with the following:
 - a. Inputs shall accept dry-contact, thermistor, 4-20 mA, and 0-5VDC
 - b. Pulse accumulation shall accommodate a maximum frequency of 100Hz
 - c. Inputs shall have a minimum 10 Bit A/D conversion resolution
 - d. 24VAC over-voltage protection
 3. In addition to field device Hardware inputs, the B-AAC shall feature the following on-board integral hardware inputs at a minimum:
 - a. Temperature sensor (local or remote)
 - 1) 10k Thermistor
 - 2) 0°C to 40°C (32°F to 104°F) range
 - 3) +/- 0.1°C (+/- 0.18°F) resolution
 - 4) User calibrated +/- 0.1°C (+/- 0.18°F)
 - b. Setpoint Adjustment Slider
 - 1) 20k potentiometer
 - 2) Range defined, limited and configured via Application Software
 - c. Relative Humidity (RH)
 - 1) 10% – 90% range
 - 2) 0.1% resolution

- 3) +/- 2% accuracy
 - 4) Replaceable sensing element
 - 5) User calibrated as necessary
 - d. Occupancy
 - 1) Passive Infrared Radiation (PIR)
 - 2) 5m/16.4' detection distance
 - 3) 100° horizontal / 82° vertical detection
 - 4) 64 detection zones
 - e. Carbon Dioxide (CO2)
 - 1) 0 – 2000ppm
 - 2) +/- 30ppm Accuracy
 - 3) Auto-Drift Calibration
 4. Hardware Outputs shall be configured as to be modular in nature and support the following characteristics:
 - a. Universal Output
 - 1) 0 – 12 VDC @ 75 mA
 - 2) Digital or Analog functional operation
 - b. Single Stage Relay
 - 1) SPDT Form C Dry Contact
 - 2) Minimum 0.5 A @ 24 VAC/VDC Contact Rating
 - 3) NO/NC Selectable
 - c. Single Stage TRIAC
 - 1) Single NO Contact for Switching AC Loads
 - 2) Minimum 0.5 A @ 24 VAC/VDC Contact Rating
 - 3) Minimum Switching Current of 20 mA
 5. Universal hardware outputs shall be provided and configured on hardware or in software and comply with the following:
 - a. Universal Outputs shall provide configurable modulating voltage signal to industry standard 0-5VDC and 0-10VDC analog control devices and relays
 - b. Outputs shall be capable of sourcing 75mA at 12VDC
 - c. Outputs shall have a minimum 8 Bit D/A conversion resolution
 - d. 24VAC over-voltage and short protection
- O. Control System Application Software:

1. The B-AAC application software shall be the same as and indistinguishable from the B-BC specified interaction with the Control System Application Software.
2. The controller software shall reside in a real time, multi-tasking, networking operating environment. Database definition shall be accomplished through the B-OWS online with the B-AAC. The complete database and application program shall reside in the B-AAC. The System Contractor shall configure the software to attain the proper sequence of control and to accomplish all other control system functions indicated in the Contract Documents.
3. The user shall be able to add, delete, or modify objects on-line as required. The programming shall provide all the necessary mathematics, logic, utility and control functions necessary for proper sequence of control.

P. Communications and Protocols

1. The B-AAC shall communicate with field devices and controllers on the BLCN using the BACnet physical data link MS/TP at 76.8 Kbps where not limited by third party devices such as variable speed drives, utility meters, etc.
2. The B-AAC shall provide a communications port for connection of the Portable Operators Terminal using Point-to-Point BACnet physical data link layer protocol or a connection to the network.
3. B-AAC shall support and be capable of monitoring and controlling a network of a minimum of four (4) communicating remote space sensors. These networked sensors shall not consume input/output hardware points in the B-AAC.

Q. B-AAC shall perform and manage historical data collection. Minimum sampling time shall be configurable with a minimum sample rate of once per second.

1. B-AAC panels shall store point history files for all analog and binary inputs and outputs.
2. Measured and calculated analog and binary data shall also be assignable to user-definable trends.
3. Up to six points of any type can be assigned to a single trend log.
4. Trend data shall be stored at the stand-alone B-AAC panels, and uploaded to hard disk storage automatically at preconfigured intervals when archival is desired. Separate archival application software will be accepted.

R. Stand-alone B-ASC panels shall automatically accumulate and store runtime hours for binary input and output points.

S. B-ASC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

T. B-ASC panels shall have the ability to count and/or execute events on a daily, weekly, or monthly basis.

U. B-AAC shall support, transmit, and receive of segmented messages.

2.8 APPLICATION SPECIFIC CONTROLLERS (B-ASC)

A. B-ASC shall comply with all aforementioned BAS System Requirements and shall comply with the BACnet profile for Application Specific Controllers (B-ASC).

B. Provide one dedicated B-ASC for each Terminal Unit Mechanical Device on the project. Those include Variable Air Volume (VAV) Air Terminal Units (ATU), Serial and Parallel Fan-Powered (FP) VAV ATU's, Unit Heaters (UH), Unit Ventilators (UV), Fan Coil Units (FCU), Roof-Top Units (RTU) and Individual Fans. Terminal Units specifically called out in the sequence of operation, as "Non-DDC" shall be excluded from this requirement.

- C. B-ASC shall provide microprocessor based self-contained stand-alone fully programmable operation of local process control loops. All local level application programs shall be installed on individual controllers in non-volatile memory.
- D. Each B-ASC shall be capable of sharing point information with other B-BC, B-AAC, or B-ASC on a peer-to-peer basis via the BACnet BLCN.
- E. Control systems that utilize 'canned' programs or programmable read only memory (PROM) level application programming are not acceptable.
- F. Once downloaded, a B-ASC shall not require further communication with the B-OWS except for data base changes, operator commands, and requests from the B-OWS for B-ASC data. Programming of B-ASCs shall be completely modifiable in the field, over installed BACnet Internetwork or remotely via modem.
 - 1. Each B-ASC shall be provided with the ability to prevent unauthorized access to its software program.
 - 2. B-ASC shall have sufficient memory to support its operating system, database, and programming requirements.
 - 3. B-ASC operating system, field database, and application programs shall reside in EEPROM.
 - 4. B-ASC run-time field database and application programs shall reside in on-board memory or EEPROM.
- G. ASC shall perform and manage historical data collection. Minimum sampling time shall be configurable with a minimum sample rate of once per second.
 - 1. B-ASC panels shall store point history files for all analog and binary inputs and outputs.
 - 2. Measured and calculated analog and binary data shall also be assignable to user-definable trends.
 - 3. Up to six points of any type can be assigned to a single trend log.
 - 4. Trend data shall be stored at the stand-alone B-ASC panels, and uploaded to hard disk storage automatically at preconfigured intervals when archival is desired. Separate archival application software will be accepted.
- H. Stand-alone B-ASC panels shall automatically accumulate and store runtime hours for binary input and output points.
- I. B-ASC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.
- J. B-ASC panels shall have the ability to count and/or execute events on a daily, weekly, or monthly basis.
- K. B-ASC for VAV ATU's application shall comply with the following:
 - 1. B-ASC shall be provided with integral damper actuator. Actuator shall feature the following at a minimum:
 - a. 35 in-lbs of torque
 - b. Brushless DC Operator
 - c. Actual damper position feedback. Drive time or other software calculated damper position shall not be accepted
 - d. Damper End Switch using motor current sense or equivalent for positive feedback of both end stop positions

- e. Software selectable rotation
2. B-ASC shall be provided with integral differential pressure transducer, with range of 0–1" wc, +/- 5% FS.
3. Universal field device hardware inputs shall be provided and configured on hardware and/or in software and comply with the following:
 - a. Inputs shall accept dry-contact, thermistor, 4-20 mA, and 0-5VDC
 - b. Pulse accumulation shall accommodate a minimum frequency of 40Hz
 - c. Inputs shall have a minimum 10 Bit A/D conversion resolution
 - d. 24VAC over-voltage protection
4. Hardware outputs for field devices shall be provided as follows:
 - a. Three (3) Universal Outputs or One (1) Universal Output, one (1) single stage TRIAC Output, and one (1) Dual Stage TRIAC Output
5. Hardware Outputs shall be configured on hardware and/or in software and comply with the following:
 - a. Universal Outputs shall provide configurable modulating voltage signal to industry 0-5VDC and 0-10VDC analog control devices and relays
 - b. Each TRIAC Output shall source 500 mA current, 24 VAC 0.5 ACA
 - c. Universal Output shall be capable of sourcing 75mA at 12VDC
 - d. Outputs shall have a minimum 8 Bit D/A conversion resolution
 - e. 24VAC over-voltage and short protection
6. Airflow Calibration, Test and Air Balance, etc. shall be performed via dedicated handheld configuration tool connected directly to communication port located at ATU B-ASC sensor] **and/or [via the integral SS Flow Calibration interface of each space mounted SS.** Special proprietary software and/or applications loaded on a computer or PDA shall not be acceptable to perform this function.
7. B-ASC shall provide diagnostic LEDs for power, communications and processor status. The B-ASC shall continually check the status of its processor and memory circuits
8. Controller wiring terminals shall be 5mm space between poles with removable terminal strips for ease of installation and service replacement
9. B-ASC Enclosure shall be rated as follows:
 - a. NEMA 1
 - b. UL 94-5V
- L. B-ASC for unitary applications shall comply with the following:
 1. B-ASC shall provide diagnostic LEDs for power, communications and processor status. The B-ASC shall continually check the status of its processor and memory circuits
 2. Controller wiring terminals shall be removable terminal strips for ease of installation and service replacement
 3. Universal field device hardware inputs shall be provided and configured on hardware and/or in software and comply with the following:
 - a. Inputs shall accept dry-contact, thermistor, 4-20 mA, and 0-5VDC

- b. Pulse accumulation shall accommodate a minimum frequency of 40Hz
 - c. Inputs shall have a minimum 10 Bit A/D conversion resolution
 - d. 24VAC over-voltage protection
 4. Hardware outputs for field devices shall be provided as follows:
 - a. Four (4) Universal Outputs, or Four (4) TRIAC Outputs or One (1) Universal Output, one (1) single stage TRIAC Output, and two (2) Dual Stage TRIAC Output
 5. Hardware Outputs shall be configured on hardware and/or in software and comply with the following:
 - a. Universal Outputs shall provide configurable modulating voltage signal to industry standard 0-5VDC and 0-10VDC analog control devices and relays
 - b. Each TRIAC Output shall source 500 mA current, 24 VAC 0.5 ACA
 - c. Universal Output shall be capable of sourcing 75mA at 12VDC
 - d. Outputs shall have a minimum 8 Bit D/A conversion resolution
 - e. 24VAC over-voltage and short protection
- M. Control System Application Software:
 1. The B-ASC application software shall be the same as and indistinguishable from the B-BC specified interaction with the Control System Application Software.
 2. The controller software shall reside in a real time, multi-tasking, networking operating environment. Database definition shall be accomplished through the B-OWS online with the B-ASC. The complete database and application program shall reside in the B-ASC. The System Contractor shall configure the software to attain the proper sequence of control and to accomplish all other control system functions indicated in the Contract Documents.
 3. The user shall be able to add, delete, or modify objects on-line as required. The programming shall provide all the necessary mathematics, logic, utility and control functions necessary for proper sequence of control.
- N. Communications and Protocols
 1. The B-ASC shall communicate with field devices and controllers on the BLCN using the BACnet physical data link MS/TP at 76.8 Kbps where not limited by third party devices such as variable speed drives, utility meters, etc.
 2. The B-ASC shall provide a communications port for connection of the Portable Operators Terminal using Point-to-Point BACnet physical data link layer protocol or a connection to the inter-network.
 3. B-ASC shall support and be capable of monitoring and controlling a network of a minimum of four (4) communicating remote space sensors, each with capability of a local LCD Display, adjustable set-point and outputs for zone controls. These networked sensors shall not consume input/output hardware points in the B-ASC.
 4. B-ASC shall support, transmit, and receive of segmented messages.

2.9 NETWORKED COMMUNICATING SPACE SENSORS

- A. Wall-Mounted Networked Communicating Space Sensors (SS) shall communicate on a daisy-chained network connected to any BAS DDC controller and shall provide additional ambient space condition sensing without the use of hardware I/O at the host controller.

- B. Each SS shall provide, where indicated on the drawings, the following minimum features: (we normally don't use stats with a display)
 - 1. 36mm x 36mm (1.4" x 1.4") display area
 - 2. Display four (4) 0.6" digits and six (6) 0.3" characters simultaneously
 - 3. Capable of displaying icons, time, analog, and digital engineering units
 - 4. Programmable to display up to ten (10) data points in any combination of local and/or networked values from any device on the internetwork
- C. Each SS shall provide a local keypad for local user interface to perform navigation and adjustment of points configured as adjustable.
- D. Each SS shall provide a point of access for a B-OWS, Service Tool, etc. to the BACnet internetwork via the SS communication network.
- E. Where indicated on the drawings each SS shall provide at a minimum the following on-board integral I/O without the consumption of any inputs and/or outputs at the host DDC controller:
 - 1. Temperature sensor (local or remote)
 - a. 10k Thermistor
 - b. 12 Bit A/D Conversion
 - c. 0°C to 40°C (32°F to 104°F) range
 - d. +/- 0.1°C (+/- 0.18°F) resolution
 - e. User calibrated +/- 0.1°C (+/- 0.18°F)
 - 2. Relative Humidity (RH)
 - a. 10% – 90% range
 - b. 0.1% resolution
 - c. +/- 2% accuracy
 - d. Replaceable sensing element
 - e. User calibrated
 - 3. Occupancy
 - a. Passive Infrared Radiation (PIR)
 - b. 5m/16.4' detection distance
 - c. 100° horizontal / 82° vertical detection
 - d. 64 detection zones
 - 4. Additional Space/Zone I/O
 - a. Two (2) thermistor or dry-contact inputs
 - b. Two (2) TRIAC Outputs (24VAC @ 0.5A)

2.10 TEMPERATURE CONTROL PANELS (TCP), ENCLOSURES & SUB-PANELS

- A. Provide pedestal base or wall mounted local control enclosure to house all control components associated with each area, system or mechanical equipment room
 - 1. The enclosures shall be minimum 16 gauge steel or aluminum, totally enclosed on all sides and painted with a baked enamel finish.

2. Enclosures located in wet indoor conditions or located outdoors shall meet NEMA 4X.
 3. Penetrations are permitted on bottom of enclosure only. Do not make conduit penetrations in top or side of enclosure. Each enclosure shall be equipped with a wire gutter below with a minimum of six ¾" minimum conduit penetrations into the bottom of the enclosure to accommodate system wiring.
 4. Where required by AHJ, enclosures located in mechanical or electrical rooms shall meet NEMA 2 requirements
 5. Enclosures located in all other locations including but not limited to mechanical or electrical rooms not requiring NEMA 2, occupied spaces, above ceilings and plenums shall be the same NEMA classification as all other enclosures located in the same environment, except if location requires additional protection due to potential vandalism or environmental conditions and shall at a minimum meet NEMA 1 requirements
 6. Enclosures provided as an integral (pre-packaged) part of another product and/or piece of equipment are acceptable
 7. Provide a continuous piano hinged door, keyed locking latch and removable sub-panel. A single key shall be common to all control enclosures.
- B. Provide each DDC panel with a surge suppressor, electrical disconnect, control fuse, and control transformer. All sized and provided by the control system contractor.
- C. Provide power supplies located inside control enclosures shall be fully enclosed with external 24 Vac terminals, on/off control, equipment overcurrent protection, power indication, high/low voltage separation, and convenience 120VAC outlets.
- D. Provide insulated, modular, feed-through, clamp-style terminal blocks suitable for rail-mounting with end plates and partitions for the termination of all field wiring in control enclosures. Field wiring to equipment with integral terminals and/or unitary equipment (i.e., VAV ATU's, EF's, &c.) shall not be required to have terminal blocks.
- E. Rail mounted terminal blocks shall be color coded to match the associated conductor colors adhering to the **UT Health** standard wire recognition coloring scheme as scheduled in section 2.11.

2.11 INTERCONNECTING WIRE & CABLE

- A. All wiring regardless of service and/or voltage shall comply with the Contract Document Division 26 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ).
- B. Where required all wiring regardless of service and/or voltage shall be in conduit in accordance with Division 26 "Raceways, Conduit and Boxes for Electrical Systems" and "Cable Trays for Electrical Systems" and shall be routed parallel to or at right angles with the structure, properly supported every six (6) feet at a minimum and installed in a workmanlike manner. BAS conduit to be blue in color.
- C. Where permitted by all applicable specifications, local codes, NEC and AHJ; plenum-rated control cabling may be used where final application will be concealed but accessible. Where plenum-rated cable is allowed, it shall be routed parallel to or at right angles with the structure, properly supported every six (6) feet at a minimum and installed in a workmanlike manner.
- D. The UT Health Energy Management Controls System wiring color shall be as below:

Low Voltage Wiring	
BACnet Communications	blue wire
24 VAC Power	Red and black jacketed conductors with black jacketed sheath over the pair

Input/ Output	White and black jacketed conductors and white jacketed sheath over the pair.
Communicating Sensor	Green jacketed sheath

2.12 GENERAL FIELD DEVICES

- A. All control relays shall be UL listed with contacts and coils rated for the application
 - 1. Relays used for in-line control start/stop of line voltage motors and shall have a current rating at least 150% full load amps.
- B. Control transformers shall be CSA and UL listed. Primary and secondary sides shall be fused in accordance with the NEC or shall be class 2 current limiting type. Transformers shall be sized such that the connected load is not greater than 80% of the transformer rated capacity.
- C. Voltage/Current to Pneumatic Transducer shall be non-bleed type 0-5V or 0-10V input and output pressure to match spring range of controlled device.
- D. Emergency shut-off switches shall be heavy duty, two-position push-pull, maintained contact, and illuminated 1-3/8 inch in diameter mushroom style push button switch. Provide hinged easy open protective clear cover to prevent accidental operation of switch.

2.13 ANALOG SENSORS

- A. Temperature Sensors:
 - 1. Temperature sensors shall be linear precision element Thermistor type.
 - 2. Single point duct temperature sensor shall consist of 316 stainless steel or platinum sensing element, junction box for wiring connections and gasket to prevent air leakage and vibration noise.
 - 3. Averaging duct temperature sensor shall consist of a copper or stainless steel averaging element, junction box for wiring connections and gasket to prevent air leakage or vibration noise.
 - 4. Liquid immersion temperature sensor shall include thermowell, sensor and connection head for wiring connections.
 - 5. Outside air temperature sensor shall consist of a single device sensor, ventilated non-metallic sun shield, utility box for terminations, and watertight gasket to prevent water seepage.
 - 6. Space temperature sensor shall consist of an element within a ventilated cover. Sensors located in mechanical areas, plenums, lobbies, hallways, restrooms or other public spaces shall be stainless steel flat plate sensors.
 - a. Terminal Unit space temperature sensors shall be provided in accordance with the drawings at the locations indicated with the following options as indicated on drawings:
 - 1) Standard Wall-Mount Space Sensor
 - 2) Setpoint Adjustment Buttons (“+” & “-”)
 - 3) Override/Bypass
 - 4) Occupancy
 - 5) CO2
 - 6) RH

- 7) Network Jack
 - b. All sensors not located in public spaces and associated with B-ASC or B-AAC that is located in normally inaccessible locations shall be the same.
 - c. Sensors shall be manually calibrated on site so that the wiring length does not detract from the sensor accuracy specified.
 7. Where necessary due to structural cavities, masonry walls, proximity to exterior openings, and unconditioned spaces an insulated mounting base shall prevent temperature of mounting location from affecting sensor temperature reading.
 8. Sensor guards shall protect sensor from damage as indicated at locations on the drawings.
 9. Provide brass or stainless steel thermowells for each immersion type temperature sensor and switch.
- B. Wet Bulb temperature and humidity station shall be suitable for duct or outside mounting and consist of sensors, ventilated non-metallic sun shield, utility box for terminations, and watertight gasket to prevent water seepage.
- C. Pressure
1. Static Air Pressure Sensor shall have linear output voltage signal. Zero and span shall be field-adjustable. Tubing shall be connected to a Pitot tube or other pressure/airflow sensing device. Under no circumstances shall tubing pass through equipment housing or ductwork.
 2. Pitot tube probe shall be at least 4 inches allowing for internal duct insulation.
 3. Steam and water gauge pressure sensor shall include connections secured to a stainless steel diaphragm sensor with a gasketed, dust and watertight housing for remote mounting.
 - a. All steam devices and sensors shall incorporate a "pig-tail" in installation
 4. The differential pressure sensor for air applications shall provide a linear output voltage signal. The device shall be capable of over-pressurization to 10 PSI without a zero-shift and shall have a field adjustable zero and span. The assembly shall consist of pressure connections that secure pressure sensor to a housing for duct or remote mounting.
 5. Differential Pressure Sensor for water shall consist of a differential pressure tap secured to a stainless steel diaphragm and an electronic sensor enclosed in a gasketed, dust and watertight case.
 6. Five-valve manifold assembly shall be required to allow isolation and bypass of operating pressures from differential pressure sensor.
 7. Snubbers shall be required to prevent system pressure hammers and surges from being fully transmitted to the pressure sensor.
- D. Position
1. Damper Position indication consists of a potentiometer mounted in housing.
 - a. Damper Position End Switches shall employ mechanical position proving. Mercury style end switches shall not be accepted.
 2. Control valve Position indicator consists of a potentiometer mounted on the valve actuator.
 3. Float type level switch with SPDT snap acting contacts. Electronics shall be housed in a watertight enclosure.
 4. Proximity Limit Switch shall be oil-tight, roller type, SPDT snap-acting switch with adjustable trim arm.

E. Flow

1. Electronic Air Flow Monitoring System (Type II): Other installations: Airflow monitoring systems shall be a solid state electronic device comprised of a thermistor based sensing grid and microprocessor based electronics panel for flow averaging, temperature compensation and signal transmission. **[Ebtron,] [Paragon,] [Tek-Air] or [Air Monitor].**
2. Water Flow In-Line Type: (For Pipe Sizes up to 1 ½ inches): In-line type flow sensor shall have a nonmagnetic spinning impeller. Sensor shall be Data Industrial Model 250B or equal.
3. Water Flow Insertion Type: (For Pipe Sizes 1 ½ inch to 10 inches): Provide a probe-mounted insertion type turbine sensor.

F. Gas

1. Refrigerant Vapor Detection System
 - a. Provide a refrigerant vapor detection system to meet ASHRAE 15-1994 and the applicable local codes. The system shall sample and monitor a minimum of two (2) remote sampling points per Chiller.
 - b. Provide the following accessories:
 - 1) One alarm relay for each level of alarm and one relay for flow failure or horn silence. Failure relay output that shall energize upon failure of monitor system operation. Failures include but are not limited to the following: low airflow through monitor, power circuit failure, and a saturated or absent sensor signal.
 - 2) Analog Output 4-20 mA or 0-5 VDC.
 - 3) Sample Pump shall be capable of drawing 0.25-1 liter/minute through 3/16 inch ID tubing for distances up to 100 ft.
 - 4) Enclosure type: NEMA 4X.
 - c. Sampling Tubing shall be Type L hard drawn copper tubing.
 - d. The read out/control unit shall be wall mounted pursuant with contract drawings. Remote sampling points shall be located within the central plant area according to the drawings.
 - e. If the equipment and installation procedures are in accordance with these Specifications, products and services from Mine Safety Appliances Instruments Company (MSA) or approved equal will be acceptable.
 - f. The water chilling unit manufacturer shall provide refrigerant data.
2. Indoor Air Quality Sensors shall measure both VOCs and CO2 in PPM. Sensors shall be mounted as indicated on the drawings.
3. Carbon Monoxide detection, where required on the contract drawings shall be a single or multi-channel, dual-level detectors, using solid-state sensors with 3-year minimum life, maximum 15-minute sensor replacement, suitable over a temperature range of 23°F to 130°F, calibrated for 50 and 100 ppm, with maximum 120-second response time to 100-ppm carbon monoxide.
4. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23°F to 130°F (-5°C to 55° C) and calibrated for 0% to 2% of full range, with continuous or averaged reading, 4- to 20-mA output for wall mounting.
5. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

6. Oxygen Sensor and Transmitter: Single detectors using solid-state zircon cell sensing; suitable over a temperature range of -32°F to 1100°F (0°C to 593°C) and calibrated for 0% to 5%, with continuous or averaged reading, 4- to 20-mA output; for wall mounting.

2.14 SWITCHING SENSORS/THERMOSTATS

A. Temperature Thermostats

1. Provide one (1) Low Limit thermostat for each 20 sq/ft of coil face. Low limit thermostat shall be of the vapor pressure remote element, manual reset type with adjustable set point. The device shall respond to the lowest temperature to which any 1 foot of the element is exposed. Capillary sensing tubing serpentine vertically across the discharge face of the coil, and be supported firmly by mechanical clips.
 - a. Low Limit thermostats shall be DPDT with a minimum of one (1) NO contact and one (1) NC contact
2. High limit thermostat shall be manual reset type. Sensing element shall be bimetal.
3. Capillary Type Thermostats shall have liquid or vapor-filled thermal system consisting of stainless steel or copper sensing element, connected to a fully compensating capillary tube, and operating bellows or spiral.
4. Surface Mounted Thermostats shall be line voltage on-off type suitable for strapped mounting to pipe.
5. Wall Mounted Thermostats shall be line voltage on-off type suitable for wall mounting.

2.15 AUTOMATIC CONTROL VALVES

A. General Requirements

1. Valves shall be provided with metallic linkage.
2. Unless otherwise indicated, all valves shall have a minimum range-ability of 50:1. All valves shall be guaranteed to have not more than 1% leakage of design flow rate at the pump shut-off pressure
3. Globe valves shall have replaceable seats.
4. Valves shall be quiet in operation.
5. Unless otherwise indicated, minimum body rating for any valve is 125 psi and maximum fluid temperature of 177°C (350°F).
6. Valves shall have stainless-steel stems and stuffing boxes with extended necks to clear the piping insulation.
7. Valve bodies shall meet or exceed pressure and temperature class rating based upon design operating temperature and 150% design operating pressure.
8. Unless otherwise indicated two and three-way Automatic Control Valves shall be globe-style bodies and comply with the following selection criteria:
 - a. Globe-style valve minimum body rating for any valve is 125 psi and maximum fluid temperature of 120°C (250°F).
 - b. Bodies for valves 2" and smaller shall be brass or bronze with NPT threaded connections, and shall be rated for ANSI Class 250 working pressure. Spring-loaded packing shall be required to protect against leakage at the stem.

- c. Bodies for valves 2½" to 3" shall be brass, bronze or iron with flanged connections and shall be rated for ANSI Class 125 working pressure. Packing shall protect against leakage at the stem.
 - d. Bodies for valves 3" to 6" shall be iron, cast iron or cast steel with flanged connections and shall be rated for ANSI Class 125 working pressure. Packing shall protect against leakage at the stem.
 - e. For modulating applications, valve Cv (Kv) shall be within 100% to 125% of the design Cv (Kv)
 - f. For two-position applications, valve Cv (Kv) shall be the largest available for the valve size
 - g. Valve and actuator combination shall be Normally-Open (NO) or Normally-Closed (NC) as shown
9. Where specified ball-style body Automatic Control Valves shall adhere to the following:
- a. Ball-style valve minimum body rating for any valve is 125 psi and maximum fluid temperature of 100°C (212°F).
 - b. Bodies for valves 2" and smaller shall be forged brass body with nickel plating, NPT threaded connections
 - c. All control ball valves shall be furnished with chrome plated bronze ball and stainless steel stem and fiberglass reinforced Teflon® seats and seals. The valves shall have a blow out proof stem design.
 - d. The stem packing shall be 2 O-rings designed for modulating service and requiring no maintenance.
 - e. All control ball valves shall feature characterized flow guides when used for modulating applications
10. Where specified butterfly-style body Automatic Control Valves shall adhere to the following:
- a. Unless otherwise indicated, butterfly valves shall have a minimum range ability of 10:1. All valves shall be guaranteed to have not more than 1% leakage of design flow rate at the pump shut-off pressure
 - b. Butterfly-style valve minimum body rating for any valve is 125 psi and maximum fluid temperature of 120°C (250°F).
 - c. Bodies for valves 3" to 12" shall be fully-lugged cast iron body
 - d. Flanges shall meet all ANSI 125 and ANSI 150 standards.
 - e. The stem shall be one piece stainless.
 - f. The 416 stainless shaft shall be supported at three locations with PTFE bushings for positive shaft alignment.
 - g. The seat shall be EPDM; Phenolic backed, non-collapsible, and easy to replace.
 - h. The disc shall be aluminum bronze to provide bubble-tight close off in either direction.
 - i. Valve shall have a long stem design to accommodate 2 inches insulation.
11. Valves for Chilled Water (CHW) and Glycol (GCHW) service shall adhere to the following:
- a. All internal trim regardless of body type shall be Type 316 Stainless Steel. Valves 3" and larger shall be butterfly valves.
12. Valves for Heating Hot Water (HHW) service shall adhere to the following:

- a. Valves for HHW service between 210°F (99°C) and 250°F (120°C) shall have all internal trim (including seats, rings, modulating plugs and springs) of Type 316 Stainless Steel
- b. Valves for HHW service below 210°F (99°C) shall have all internal trim (including seats, rings, modulating plugs and springs) of Brass, Bronze or Type 316 Stainless Steel
- c. Nonmetallic valve components shall be suitable for a minimum continuous operating temperature of 250°F (120°C) and/or 50°F (10°C) above the system design temperature, whichever is higher

2.16 VALVE ACTUATORS

- A. Actuators used in wet conditions and/or in or near outdoor air streams shall have NEMA 2 housings.
- B. Valve Actuators shall be modulating, with feedback signal, two-position and spring return fail safe as called out in the control sequence of operation or indicated on the drawings. All modulating valves shall be positive positioning, and respond to a 0-10VDC or 2-10 VDC with the exception that terminal unit zone valves may use an actuator that responds to a floating or tri-state with feedback signal.
- C. All control valves shall have a visual position indicator.
- D. All non-spring return actuators shall have an external clutch/manual gear release to allow manual positioning of the valve when the actuator is not powered. Spring return actuators with more than 60-in-LB torque capacity shall have a manual crank for this purpose. In lieu of a manual positioning device, it will be acceptable for the contractor to provide a full line size bypass around the control valve. Three bypass shut off valves shall be provided to allow the control valve to be isolated while the open stop valve in the bypass allows flow around the control valve.
- E. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.
- F. Any mechanical equipment with direct introduction of outside air shall require fail-safe spring return valve actuators. Terminal equipment (VAV ATU, etc.) without direct introduction of outside air are permitted to have actuators that maintain their last commanded position when power is lost to the actuator. Equipment isolation and differential or temperature pressure bypass valves shall not be required to be provided with a spring return actuator provided that a failure of the valve to return to its "fail-safe" position will not incur damage to property or the system it serves.

2.17 AUTOMATIC CONTROL DAMPERS

- A. All Automatic Control Dampers provided as a part of this Specification shall bear the AMCA Seal as an indication that they comply with all requirements of the AMCA Certified Ratings Programs.
- B. A single damper section shall have blades that do not exceed 48" in length and shall be no higher than 72". Damper blades shall not exceed 8" in width. Applications requiring larger dampers shall be achieved by combining single damper sections.
- C. Frame construction shall be a minimum of 14 gauge galvanized steel formed into channels and welded, 14 gauge galvanized roll-formed steel or extruded aluminum at a minimum 4½" by 1' by 0.125" thick.
- D. Blades and baffles shall be fabricated of minimum 16 gauge steel with corrosion resistant galvanized finish or extruded aluminum 6" by 0.08".
- E. All dampers shall be provided with nylon, cyclopy or oilite bearings, stainless steel or elastomeric side seals, and zinc plated hardware as standard.
- F. Axles shall be a minimum of ½" diameter and be locked to blade with rivets or welded.

- G. Dampers shall be made up of 6" or 8" blades or combination of the two. Dampers shall have a minimum of four blades running the entire length. Silicone or polyurethane blade edging shall be furnished on all dampers.
- H. Maximum leakage rate through any 48 inches by 48 inches closed damper in any application shall not exceed 10.0 cfm per sq. ft. of damper face area at 6 inches of water pressure differential and a maximum closing torque of 4 inch-lbs/sq. ft. of damper face area. Damper leakage ratings shall be certified in accordance with AMCA Standard 500-D.
- I. Blades mounted vertically shall be supported by thrust bearings
- J. All Automatic Control Dampers in modulating applications shall be sized so as to achieve linear airflow characteristics
- K. Flow Control Application Dampers (Opposed Blade Operational Style)
 - 1. Opposed Blade Automatic Flow Control Dampers shall be required as indicated on the drawings for:
 - a. All mixing, volume throttling, airflow control, &c. applications installed in Outdoor, Relief, Exhaust, and/or Supply airstreams.
 - b. Any application upstream of critical components
 - c. Ducted Outlets
 - d. Automatic Flow Control Dampers specifically indicated to be provided by Mechanical Equipment manufacturer and/or as a component of packaged equipment shall not be provided by the Contractor.
 - 2. To minimize leakage, blade edges shall be interlocked and blade seals shall be compressible at all contact points. Channel frames shall also be provided with jamb seals.
 - 3. All Outdoor Air Damper components shall be suitable for applications operating in the temperature range of -40°F (-4°C) to 167°F (75°C)
 - 4. Damper shall be rated for a minimum velocity of 2000 ft/min
- L. Mechanical Ventilation, Miscellaneous Utility Dampers (Parallel Blade Operational Style)
 - 1. Parallel Blade Automatic Flow Control Dampers shall be permitted as indicated on the drawings for applications not requiring Opposed Blade operation pursuant with that specification section and for:
 - a. Two-position (fully-open or fully-closed) applications
 - b. Applications where the damper constitutes the primary source of total system pressure loss
 - c. Applications where greater control is required at the upper end of airstream volume operating range
 - d. Mechanical Space ventilation and exhaust, combustion intake & exhaust, etc.
 - 2. Shall comply with AMCA 500-D Class 4 and shall not leak in excess of 80cfm per sq/ft at 6" wc static pressure when closed.
 - 3. Damper shall be rated for a minimum velocity of 1500 ft/min
- M. Operating Linkages and Damper Accessories
 - 1. All operating linkages and/or damper accessories required for installation and application in accordance with specification design intent and manufacturer's installation procedures shall be provided

2. Operating linkages provided external to dampers (crank arms, connecting rods, shaft extensions, etc.) for transmitting motion from the actuator/operator to dampers shall be designed as to functionally operate a load equal to or in excess of 300% of the maximum required operating force for the damper.
3. Crank arms and connecting rods shall be adjustable. Linkages shall be brass, bronze, zinc-coated steel, or stainless steel.
4. Adjustments of Crank Arms shall control the position of the damper
5. Use of Operating Linkages external to damper drive shaft shall neither delay nor impede operation of the damper in a manner of performance less than a direct-coupled damper actuator. Operating linkages shall not under any circumstances be permitted to flex, warp, shift &c. under normal operation of connected damper sections.

2.18 AUTOMATIC CONTROL DAMPER ACTUATORS

- A. Control damper actuators shall be electronic direct-coupled type. Actuators shall have a means for reversing drive direction and a manual override accessible at the front cover.
- B. Single bolt or setscrew type fasteners are not acceptable.
- C. The actuator shall have electronic overload or digital rotation sensing circuitry. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
- D. For spring return fail-safe applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.
- E. All non-spring return actuators shall have an external manual clutch/gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-LB torque capacity shall have a manual crank for this purpose.

PART 3 – EXECUTION

3.1 GENERAL

- A. BAS component locations are the responsibility of the System Contractor. All control system components shall be installed in locations as required to properly sense the controlled medium.
- B. BAS Installation shall be performed by professionals in a workmanlike manner and in compliance with the Contract Documents, Division 26 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ) and the following:
 1. Complete BAS installation including all DDC Devices, Enclosures, wiring, equipment, control devices and sensors shall be installed in accordance with the manufacturers' recommended installation procedures and as specified.
 2. All control devices are to be provided and installed with all required gaskets, seals, flanges, connection enclosures, thermal compounds, insulation, piping, fittings and valves as required for design operation, isolation, equalization, purging and calibration.
 3. Strap-on control devices shall not be permitted except as explicitly called out
 4. All control devices mounted outdoors shall be protected by a weather-shield, integral outdoor enclosure, &c. from ambient elements in such a manner as to not impede design functionality and/or sensing
 5. BAS installation shall be such that it provides sufficient clearance for system maintenance by maintaining sufficient access for equipment, device and/or component service, calibration, removal, repair or replacement.

6. BAS installation shall not interfere with required clearance for mechanical and/or electrical equipment maintenance.
 7. Penetrations through and mounting holes in the building exterior associated with the BAS installation shall be sealed and made water-tight
 8. Dielectric isolation shall be provided where dissimilar metals are used in installation for connection and support
 9. Installation, wiring and material shall be protected from damage by and during BAS installation by BAS Contractor,
- C. The Contractor shall be responsible for their work and equipment until finally inspected, tested and accepted. The Contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed.
- D. After completion of installation, calibrate and commission all components provided as part of the Control System and demonstrate proper sequence of operation in compliance with the specifications. BAS components not operating correctly shall be field corrected or replaced.

3.2 DIRECT AND WEB-ENABLED BAS APPLICATION SOFTWARE

- A. At time of acceptance all operating system, Third party and Control System Application software shall be at least the latest official release version available.
- B. Software programs are described to their general intent. It is recognized that Networked System manufacturer's software differ; however, the Application software provided shall incorporate the features described fully implemented and optimized to provide the sequences described, minimize energy consumption and prolong equipment life.
- C. The following standard naming convention shall be utilized for the naming of BACnet Devices on the BACnet internetwork.
1. The convention for object names must adhere to the standards set by **UTHealth** Energy Management Environmental Controls System (EMECS) office.
- D. When programming the system BACnet addressing rules will be strictly adhered to. All addressing strategies will have to be approved by **UTHealth** EMECS office prior to configuring any LAN types.
- E. All analog and binary values shall be programmed with appropriate alarms.
- F. Except as specified otherwise, throttling ranges, proportional bands, and switching differentials shall be centered on the associated set point.
- G. All set points unless otherwise indicated are adjustable and shall be programmable for all control loops.
- H. Each control loop and/or interlock(s) for all mechanical system including terminal unit systems shall be programmed with a control loop specific graphical trend to trend all values associated with each specific control loop or system interlock.
- I. Where any sequence or occupancy schedule calls for more than one motorized unit to start simultaneously, the system start commands shall be staggered by 60-second (adj.) intervals to minimize inrush current.
- J. Scheduling shall be developed for each mechanical system. Final schedules shall be coordinated with **UTHealth** EMECS office prior to system commissioning. Until indicated otherwise the following schedule shall be used:
1. Occupied: Monday – Friday/07:00 – 20:00
 2. Unoccupied: All other times and all statutory holidays.

- K. Optimal start/stop programs shall be applied to all regularly scheduled mechanical and electrical systems.
- L. At a minimum, trend log/historical data shall be implemented for every hardware point on the system. All software (virtual) points used as setpoints shall be trended. Point trends shall be grouped into logically interrelated points for individual mechanical and building systems. Initial set-up shall be to log values once every 5 minutes. Refer to points list on electrical and mechanical drawings for components requirements.
- M. B-OWS Graphical User Interface (GUI) must be approved by **UTHealth** EMECS office and shall incorporate at a minimum the following:
 - 1. At a minimum, all physical hardware, sensors, control devices and set points shall be visible on a B-OWS in graphical form.
 - 2. All mechanical systems shall have a programmed real time color graphic for primary graphical user interface
 - 3. Individual floor plan graphics will be programmed for each floor or area of the building. All space sensors will be visible on floor plan graphics and system graphic.
- N. The system shall observe the following command priorities (from highest to lowest):
 - 1. Smoke Control and Life Safety (BACnet Object Priority Array Level 1 & 2)
 - 2. Manual Operator Command (BACnet Object Priority Array Level 8)
 - 3. Energy Management (BACnet Object Priority Array Level 9)
 - 4. Normal Automatic Control (BACnet Object Priority Array Level 10)

3.3 DIRECT AND WEB-ENABLED SERVER, (B-OWS) HARDWARE

- A. Provide as specified for each PC-Based B-OWS
- B. Assemble server components in a configuration that allows easy operator access to all necessary components from one position. Locate components as required by the **UTHealth** EMECS office.
- C. Connect to LAN as required. If LAN/WAN is not dedicated to the BACnet network then Contractor shall develop a LAN/WAN System Architecture diagram denoting server B-OWS relative to other nodes on its segment of the LAN/WAN. This diagram shall be submitted at a minimum as a part of the As-Built and O&M Documentation.
- D. Provide sufficient permanent and removable storage drives for 25% free memory after provision for all operating system, Third party and Control System Application software, all fully configured point databases, storage/back-up of all B-BC, B-AAC and B-ASC application programming, all graphic files, all user-defined reports and a three years archive of all trend and historical data described in this specification.
- E. Provide sufficient RAM to meet system performance requirements.

3.4 LOCAL AREA NETWORKS (LAN)

- A. The control system shall be configured so that any individual network shall not exceed 80% of its total design network capacity. The system shall have a reserve of 20% network capacity.
- B. Where possible all Hubs, Switches, Half and Full Routers will be from the same manufacturer. Switches will be all "Store and Forward" type and will be installed in accordance with manufacturer specifications.
- C. Inverted Networks will not be allowed. Networks with minimum packet sizes smaller than those it connects to will not interconnect networks with larger minimum packet sizes. If three or more networks

are interconnected the network with the highest speed and minimum packet size will be utilized to interconnect the slower networks.

- D. Where BACnet/IP LAN type is used, non-TCP/IP devices shall not be used. Where BACnet/IP is provided it shall comply with all Addendum to ANSI/ASHRAE 135-1995 BACnet/IP.

3.5 BACnet PROTOCOL VERIFICATION SOFTWARE

- A. Demonstrate exclusive communication utilizing the BACnet Protocol on all segments of the BACnet network.

3.6 BUILDING CONTROLLER (B-BC)

- A. Provide as required to meet performance requirements of the system with a 20% increase in connected B-AAC and B-ASC on any individual network. Provide a dedicated B-BC for all project specific equipment requiring this controller type.
- B. Locate strategically such that B-BC locations are as equally distributed throughout the project as possible.

3.7 ADVANCED APPLICATION CONTROLLERS (B-AAC)

- A. Provide a dedicated B-AAC for each medium-sized mechanical system.
- B. All points used for a single mechanical system shall be connected to the same B-AAC. Points used for control loop reset based on outside air, or space/zone temperature, or extremely remote differential pressure sensors on slow acting control loops are exempt from this requirement.
- C. Provide spare additional I/O such that future use of spare capacity shall require providing only the field device, field wiring, point database definition and operational sequence programming changes as required. Additional point modules may be required to implement use of these spare points.
 - 1. Provide at least one (1) spare universal input and one (1) spare universal output or 15% spare I/O of the total capacity of each B-AAC whichever is greater.
 - 2. If B-AAC I/O is not universal then provide at least one (1) spare analog input, one (1) spare digital input, one (1) spare analog output and one (1) spare digital output or 15% spare I/O of the total capacity for each point type of each B-AAC whichever is greater.

3.8 APPLICATION SPECIFIC CONTROLLERS (B-ASC)

- A. Provide a dedicated B-ASC for each Terminal Unit Mechanical Device on the project, including VAV and Fan Powered Terminal Units, Unit Heaters, and Individual Fans. Terminal Units specifically called out in the sequence of operation, as "Non-DDC" shall be excluded from this requirement.
- B. All points used for a single Terminal Unit Mechanical Device shall be connected to a dedicated B-ASC. Points used for control loop reset based on outside air, or space/zone temperature, or extremely remote differential pressure sensors on slow acting control loops are exempt from this requirement.
- C. VAV ATU and FP-VAV ATU Controllers
 - 1. Provide networked B-ASC for each VAV ATU and FP-VAV ATU consisting of a controller, damper actuator, and velocity transducer.
 - 2. The ATU manufacturer shall provide a transformer, and factory wire the B-ASC and other unit mounted control devices such as actuators.
 - 3. The ATU shall be provided with multi-point averaging type flow sensor factory piped to the velocity transducer.
 - 4. Provide a networked communicating room sensor for each terminal unit that shall be field mounted and wired. Networked communicating room sensors shall be capable of performing airflow calibration and TAB functions without additional hardware or software.

5. Where indicated on the drawings and/or in one (1) location per floor, wing, building or section (whichever is more frequent), install networked communicating room sensor enabled to provide BACnet network connection to Service Tool and/or Portable B-OWS.

3.9 LOCAL SYSTEM NETWORK INTERFACE

- A. At a minimum the Portable B-OWS shall be able to connect to the BACnet Internetwork within each mechanical equipment space within the project. For manufacturers systems that do not allow direct portable B-OWS connections to B-AAC and B-ASC this may require that a higher level LAN be routed to each mechanical equipment space with a jack.

3.10 TEMPERATURE CONTROL PANELS (TCP), ENCLOSURES & SUB-PANELS

- A. All system components not designed for or required to be field installed shall be mounted in a control enclosure. Those components shall be sub panel mounted except components that are mounted on the panel face. Provide on/off power switch with over-current protection for control power sources in each local enclosure.
- B. All control enclosures shall be located as shown on the drawings and wherever possible (or where not indicated on the drawings) so that visual observation and adjustment can be accomplished while standing flatfooted on the floor in a convenient location adjacent to the equipment served. Install all equipment in readily accessible location as defined by Chapter1 Article 100 Part A of the NEC.
- C. Label all control system components.
- D. A copy of the "As-built" application engineering for the system served shall be laminated in clear plastic, shall be legible and suspended within enclosure.
- E. All B-BC shall be mounted in an enclosure.

3.11 INTERCONNECTING WIRING AND CABLING

- A. General
 1. It shall be the System Contractor's responsibility to provide all wiring required for a complete Control System.
 2. Control system wiring and cabling installed for this project shall be performed by professionals in a workmanlike manner and in accordance with the Contract Documents, Division 26 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ) and shall include but may not be limited to the following:
 - a. All power wiring required not indicated on the electrical plans and specifications.
 - b. Power to all actuators and sensors.
 - c. Provide all wiring and cabling for network communications except for owner provided LAN's/WAN's.
 - d. All sensor and control device input and output wiring.
 - e. All interconnecting cabling between and amongst network devices, PCs printers, modems, etc.
 - f. Interlock wiring between devices, and between motor starters.
 - g. All other necessary wiring for fully complete and functional system as specified.
 - h. Install piping, wiring/cabling routed parallel to or at right angles with the structure, properly supported every six (6) feet at a minimum and installed in a workmanlike manner.
 3. Maximum allowable voltage for control wiring shall be 120-volts.

4. All wiring shall be installed as continuous links. Any required splices shall be made only within an approved junction box or other approved protective device with a maximum fill of 50%.
 - a. BACnet network cabling shall not be field spliced
5. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
6. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

B. Power Wiring and Cabling

1. Where required, power wiring for the control system shall be from circuits on emergency power panels. At a minimum; B-BC's, the B-OWS and any other DDC devices and control devices connected to and/or responsible for system critical equipment shall be powered from circuits on emergency power panels.
2. Power wiring for all enclosures and equipment, including branch circuit wiring from circuit breaker panels shall be the responsibility of the System Contractor unless specifically shown on the Plans or Specifications to be provided under Division 26. Dedicated branch circuits shall be provided under Division 26.
3. All B-OWS equipment shall be served from isolated ground receptacles via UPS by dedicated branch circuits.
4. All other enclosures, sensor and control devices shall be fed from separate circuits in the electrical distribution panels and shall not be served from the typical floor receptacle or lighting circuits.

C. Network Wiring and Cabling

1. Network installation shall strictly adhere to the manufacturer's networking installation instructions and procedures
2. All communications wire shall be externally identified as "Building Energy Management System Network" at least once every five feet.
3. Network installation shall conform to standards for the LAN types and cabling types selected. Specific network rules inherent to the ANSI/AHRAE Standard 135-1995, BACnet will be followed. Those include but are not limited to:
 - a. Only one path can exist from any BACnet device to another
 - b. Each BACnet device connected to an internetwork LAN must have a unique device instance (0 - 4,194,303).
 - c. Each internetwork LAN must have a unique Network Number (1 - 65,545).
 - d. Wire type used for MSTP, RS-485 twisted pair communications must be balanced twisted pair with 100 to 120 Ohms Characteristic Impedance. The wire shall be less than 30 pF per foot, and preferred 22AWG or lower. A shield wire shall be included for ground connection.
4. Primary LAN Network wire and cable shall be run separately from all other wiring.
5. Other LAN Network wire and cabling shall be installed separate from any wiring over thirty (30) volts.
6. All communications shielding shall be grounded as per Networked System manufacturer's recommendations.

D. Installation

1. Except in mechanical and electrical spaces where other conduit or piping is exposed, conceal wiring and cabling as much as possible and install and comply with the requirements of the

Contract Documents, Division 26 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ)

2. All wiring and cabling installed in and/or routed through TCP, Enclosures and Sub-Panels shall regardless of voltage and/or service be fastened securely using cable ties, non-metallic wiring duct and/or other standard industry wiring management means and methods in a workmanlike manner parallel and/or perpendicular with enclosure.
3. All TCP, Enclosures, Sub-Panels, Junction Boxes, Pull Boxes, Troughs, Trays, Raceways, Conduits, etc. shall not exceed 70% maximum conductor fill. Blue conduit for control wire.
4. Each Input/ Output device shall be controlled from a dedicated 2-pair conductor
5. Each Input/ Output device requiring power shall have a dedicated power wire run to the control enclosure and shall be terminated to a dedicated terminal strip
6. All wire with controls enclosure shall be neat and suitably bundled and contained in Panduit wire duct or equivalent
7. All wiring will be suitably identified by thermal print heat shrink tubing at controller and Input/ Output device.

3.12 ANALOG SENSORS

A. Temperature

1. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
2. Install and properly support all enclosures and sensing elements as much as possible in the center of duct cross section and in straight duct runs. In condensing environments use stainless steel flanges to support sensing elements.
3. Sensors mounted on air ducts having exterior insulation shall be provided with handy-box mounting with insulating material firmly fitted around handy-box.
4. Sensors for mixed air and outdoor air streams greater than 6 square feet or 24" in either direction shall be averaging type. Provide a minimum of 1 linear foot of sensor per 4 square feet of duct area or equal to duct width where installed, whichever is longer. Averaging sensing tubing shall serpentine vertically across airstream and be supported firmly by mechanical clips.
5. Temperature sensors installed in piping or tanks shall be in separable thermowells. Sensors shall be inserted into thermowells with conductive paste. Assembly shall allow removal of sensor without loss of fluid.
6. At a minimum one outside air temperature sensor shall be installed. It shall be mounted outside on a northern exposure as high as serviceable on the building. The sensor shall be mounted within a ventilated enclosure to shield the sensor from the effects of the sun. The sensor location shall be selected such that it may not be affected by artificial and/or mechanical airstreams (i.e., building exhaust, building relief, etc.).
7. Terminal Unit Sensors shall be provided one per terminal unit device with the exception of large non-partitioned areas served by multiple terminal units.
 - a. They shall be wall mounted in the space served 60" above finished floor and located as shown on drawings.
 - b. Provide a minimum of 16' of coiled temperature sensor control wiring for equipment with space sensor not located on the Drawings.
 - c. In all areas where terminal unit sensor locations are not known at the time of building startup, sensors shall be hung approximately 24 inches from the ceiling in the area of the

controlled zone and connected. Control wiring shall be neatly coiled and attached to ceiling grid. Sensors located in service corridors where subject to regular damage shall be mounted 84" above finished floor.

8. Zone temperature sensors shall not be located on perimeter walls. Where explicitly indicated on drawings to do so and/or in locations near exterior walls and/or subject to drafts sensors shall have insulated mounting bases to prevent false room temperature readings.
9. Where wall sensors are mounted in an area subject to damage provide suitable protective guard.
10. Where wall sensors are mounted in public spaces with adjustable set points provide suitable security guard.
11. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.1°C (0.2°F).

B. Wet Bulb

1. For outside air mount same as outside air temperature sensor.
2. For duct mounting execute same as duct mounted temperature sensor.

C. Pressure

1. Orient static pressure sensing taps faced directly down-stream in the airflow so as to eliminate velocity pressure effects. Locate pressure transducers within 50' of sensing point and use tubing sized such as to prevent signal phase lag.
 - a. Final location of static/differential pressure sensing taps shall be pursuant with Contract Documents and as indicated on drawings. Where not explicitly indicated on drawings, pressure sensing taps shall be located as follows:
 - 1) Duct static pressure control sensor tap shall be located 2/3 distance from the Air Handling Unit of the total duct length in a straight section of ductwork with a minimum of four (4) duct diameters in both directions
 - 2) Positive static high-pressure safety cut-outs shall be located at Air Handling Unit immediately downstream of fan section
 - 3) Mixed-Air static and/or differential sensor tap shall be located in mixing box section
 - 4) Negative static pressure safety cut-outs shall be located immediately upstream of fan section
 - 5) Filter differential pressure taps shall be installed on both filter inlet and outlet
 - b. Mount air differential pressure taps so that true differential is sensed
2. Water gauge taps shall include snubbers and isolation valves
3. Water differential pressure sensors shall be piped through a five-valve bypass assembly with snubbers

D. Position

1. Mount damper position indicator onto damper blade and out of air stream as much as possible.

E. Flow

1. Mount airflow measuring station differential pressure sensor outside of fan casing.

3.13 SWITCHING SENSORS

A. Temperature

1. Wherever mixed or entering air temperatures are below 35°F (1.4°C), the sensing tube shall be installed across the leaving face of the first coil in the airstream. The low-temperature thermostat shall be arranged to stop the units supply fan and its associated return air fan should the temperature at any point along the sensing element fall below 35°F (1.4°C). Provide a minimum of one foot of sensing element for each square foot of coil face area. In condensing environments use stainless steel sensing element and capillary mounting clips.

B. Differential Pressure

1. Differential pressure type switches shall be installed as per differential pressure sensors and shall provide a maximum switching differential of 10% of the sensed operating range for the application at minimum and maximum designed flow rates. Set point shall be selected to operate at midpoint of span.
2. Paddle type water flow switch shall be used to verify flow through chillers, other applications for operational, safety or other critical control interlock, on-off flow status monitoring, and at locations as indicated on the Drawings. Provide with NEMA 4 enclosure when installed in a condensing environment.
3. Differential pressure type water flow switch shall be used for on-off flow status monitoring of equipment and to position secondary chilled water loop return control valves. The sensing tubes shall be installed between the equipment and the nearest service valves.

C. Position

1. Mount damper blade end switch in such a manner that it is located out of the airstream as much as possible. End switch as installed shall be repeatable to within a range of 5 degrees. Under no circumstances shall mercury-style end switches be permitted.

D. Direct drive motors are permitted to utilize a current switch without an adjustable set point.

3.14 AUTOMATIC CONTROL VALVES

A. Flow characteristics shall be as follows:

1. Flow type for 2-way valves shall be equal percentage, except for terminal unit zone valves, and differential pressure control applications.
2. Flow type for 3-way valves shall be linear, except for terminal unit zone and ball valves.
3. Terminal unit zone, differential pressure applications shall be linear flow characteristic.

B. Two-way, control valves shall be provided for all convectors, fin radiation, horizontal unit heaters, unit ventilators, and all steam applications.

C. Two-way control valves shall be provided for all cabinet unit heaters, duct coils, and any other locations noted on drawings.

D. Two-way valves shall not be placed on branch or main hydronic circuits where these valves will cause a "dead-head" pumping condition. Three-way valves shall be used to avoid this condition.

E. Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

1. Two-Way liquid valves shall be 150% of total system (pump) head.
2. Three-Way liquid valves shall be 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head, whichever is greater.

F. Water Sizing Criteria at full flow:

1. Two-position service shall be line size.
2. Two-way or three-way modulating service shall have a maximum pressure drop not to exceed 4 PSI.

3. Differential pressure modulating service shall have a maximum pressure drop not to exceed 12 PSI.

3.15 VALVE ACTUATORS

- A. When an air handling unit or major piece of mechanical equipment is not in operation, control devices shall remain in their "off" positions. Fail-safe positions shall be the same and defined as follows:

<u>DEVICES</u>	<u>OFF/FAIL-SAFE POSITION</u>
1. HHW Coil Valves:	As-is position to Coil/Equipment
2. CHW Coil Valves:	As-is position to Coil/Equipment

3.16 DAMPER ACTUATORS

- A. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
- B. Spring return actuators shall be provided except as follows.
 1. Terminal or unitary equipment without direct introduction of outside air are permitted to have actuators that maintain their last commanded position when power is lost.
 2. Damper actuator shall not be required to be provided with spring return provided that it is not directly connected to Outdoor Air and a failure of the damper to return to its "normal" position will not incur damage to the system/space it serves.
- C. Modulating actuators shall be provided for terminal unit mechanical devices may use an actuator that responds to a floating or tri-state signal.
- D. Minimum torque and power output requirements of actuators shall not be less than 1.2 times required design load.
- E. When an air handling unit or major piece of mechanical equipment is not in operation, control damper shall remain in their "off" positions. Fail-safe positions shall be the same and defined as follows

<u>DEVICES</u>	<u>OFF/FAIL-SAFE POSITION</u>
1. Outdoor Air Dampers:	Closed
2. Return Air Dampers:	Open
3. Exhaust/Relief Air Dampers:	Closed

BAS Point Naming Standards FOR AHU and VAV

THE UT WAY - AHU		
Point Name	Extended Label	Point Description
CCC.AC1_5.FAN_C	CCC_AC1_5_FAN_C	Fan Command
CCC.AC1_5.FAN_S	CCC_AC1_5_FAN_S	Fan Status
CCC.AC1_5.FAN_CFM	CCC_AC1_5_FAN_CFM	Fan CFM
CCC.AC1_5.FAN_VEL	CCC_AC1_5_FAN_VEL	Fan Velocity
CCC.AC1_5.FAN_P_S	CCC_AC1_5_FAN_P_S	Fan Pressure Status
CCC.AC1_5.FAN_DP	CCC_AC1_5_FAN_DP	Fan DP
CCC.AC1_5.VFD_C	CCC_AC1_5_VFD_C	VFD Command
CCC.AC1_5.VFD_FB	CCC_AC1_5_VFD_FB	VFD Feedback
CCC.AC1_5.VFD_A	CCC_AC1_5_VFD_A	VFD Alarm
CCC.AC1_5.DA_T	CCC_AC1_5_DA_T	Discharge Air Temperature
CCC.AC1_5.DA_T_SP	CCC_AC1_5_DA_T_SP	Discharge Air Temperature Setpoint
CCC.AC1_5.DA_SMK_A	CCC_AC1_5_DA_SMK_A	Discharge Air Smoke Alarm
CCC.AC1_5.CLG_V_C	CCC_AC1_5_CLG_V_C	Cooling Valve Command
CCC.AC1_5.CLG_V_FB	CCC_AC1_5_CLG_V_FB	Cooling Valve Feedback
CCC.AC1_5.PH_V_C	CCC_AC1_5_PH_V_C	Pre-Heat Valve Command
CCC.AC1_5.PH_V_FB	CCC_AC1_5_PH_V_FB	Pre-Heat Valve Feedback
CCC.AC1_5.LL_A	CCC_AC1_5_LL_A	Low Limit Temp Alarm
CCC.AC1_5.PH_T	CCC_AC1_5_PH_T	Pre-Heat Temperature
CCC.AC1_5.DA_P1	CCC_AC1_5_DA_P1	Discharge Air Pressure 1
CCC.AC1_5.DA_P2	CCC_AC1_5_DA_P2	Discharge Air Pressure 2
CCC.AC1_5.DA_DP_SP	CCC_AC1_5_DA_DP_SP	Discharge Air Pressure Setpoint
CCC.AC1_5.HS_A	CCC_AC1_5_HS_A	High Static Pressure Alarm
CCC.AC1_5.FIL1_A	CCC_AC1_5_FIL1_A	Pre-Filter Alarm
CCC.AC1_5.FIL2_A	CCC_AC1_5_FIL2_A	Final Filter Alarm
CCC.AC1_5.OA_T	CCC_AC1_5_OA_T	Outside Air Temperature
CCC.AC1_5.OA_DMP_C	CCC_AC1_5_OA_DMP_C	Outside Air Damper Command
CCC.AC1_5.OA_DMP_FB	CCC_AC1_5_OA_DMP_FB	Outside Air Damper Feedback
CCC.AC1_5.OA_CFM	CCC_AC1_5_OA_CFM	Outside Air CFM
CCC.AC1_5.OA_VEL	CCC_AC1_5_OA_VEL	Outside Air Velocity
CCC.AC1_5.RA_T	CCC_AC1_5_RA_T	Return Air Temperature
CCC.AC1_5.RA_DMP_C	CCC_AC1_5_RA_DMP_C	Return Air Damper Command
CCC.AC1_5.RA_DMP_FB	CCC_AC1_5_RA_DMP_FB	Return Air Damper Feedback
CCC.AC1_5.RA_H	CCC_AC1_5_RA_H	Return Air Humidity
CCC.AC1_5.RA_CO2	CCC_AC1_5_RA_CO2	Return Air CO2
CCC.AC1_5.RA_SMK_A	CCC_AC1_5_RA_SMK_A	Return Air Smoke Alarm
CCC.AC1_5.REL_DMP_C	CCC_AC1_5_REL_DMP_C	Relief Air Damper Command
CCC.AC1_5.REL_CFM	CCC_AC1_5_REL_CFM	Relief Air CFM
CCC.AC1_5.REL_VEL	CCC_AC1_5_REL_VEL	Relief Air Velocity
In this example - the building name is "CCC"		
In this example - the AHU name is "AC1_5"		

THE UT WAY - VAV				
CCT NAME	NAME	EXTENDED LABEL	DESCRIPTION	
ZN-T	UCT.VAV1_10E_###.ZN_T	UCT-VAV1_10E_###-ZN_T	### ZONE TEMPERATURE	
ZNT-SP	UCT.VAV1_10E_###.ZN_T_SP	UCT-VAV1_10E_###-ZN_T_SP	### ZONE TEMPERATURE SETPOINT	Adjustable
HTGOCC-SP	UCT.VAV1_10E_###.OCC_HTG_SP	UCT-VAV1_10E_###-OCC_HTG_SP	### OCCUPIED HEATING SETPOINT	Adjustable
CLGOCC-SP	UCT.VAV1_10E_###.OCC_CLG_SP	UCT-VAV1_10E_###-OCC_CLG_SP	### OCCUPIED COOLING SETPOINT	Adjustable
HTGUNOCC-SP	UCT.VAV1_10E_###.UNOCC_HTG_SP	UCT-VAV1_10E_###-UNOCC_HTG_SP	### UNOCCUPIED HEATING SETPOINT	Adjustable
CLGUNOCC-SP	UCT.VAV1_10E_###.UNOCC_CLG_SP	UCT-VAV1_10E_###-UNOCC_CLG_SP	### UNOCCUPIED COOLING SETPOINT	Adjustable
OCC-OVERRIDE	UCT.VAV1_10E_###.OCC_C	UCT-VAV1_10E_###-OCC_C	### OCCUPANCY COMMAND	Adjustable
OCC-S	UCT.VAV1_10E_###.OCC_SENSOR	UCT-VAV1_10E_###-OCC_SENSOR	### OCCUPANCY SENSOR	
EFF-OCC	UCT.VAV1_10E_###.OCC_S	UCT-VAV1_10E_###-OCC_S	### OCCUPANCY STATUS	
HD-F	UCT.VAV1_10E_###.HD_F	UCT-VAV1_10E_###-HD_F	### HOT DECK FLOW	
HDFLOW-SP	UCT.VAV1_10E_###.HD_F_SP	UCT-VAV1_10E_###-HD_F_SP	### HOT DECK FLOW SETPOINT	Adjustable
CD-F	UCT.VAV1_10E_###.CD_F	UCT-VAV1_10E_###-CD_F	### COLD DECK FLOW	
CDFLOW-SP	UCT.VAV1_10E_###.CD_F_SP	UCT-VAV1_10E_###-CD_F_SP	### COLD DECK FLOW SETPOINT	Adjustable
CD-%	UCT.VAV1_10E_###.CD_F_EFFC	UCT-VAV1_10E_###-CD_F_EFFC	### COLD DECK FLOW EFFECTIVE COMMAND	
HD-%	UCT.VAV1_10E_###.HD_F_EFFC	UCT-VAV1_10E_###-HD_F_EFFC	### HOT DECK FLOW EFFECTIVE COMMAND	
AUTOCAL-C	UCT.VAV1_10E_###.AUTOCAL_C	UCT-VAV1_10E_###-AUTOCAL_C	### AUTOCALIBRATE COMMAND	Adjustable
AUTOCAL-STATE	UCT.VAV1_10E_###.AUTOCAL_S	UCT-VAV1_10E_###-AUTOCAL_S	### AUTOCALIBRATE STATUS	
<p># --- replace with the sequence number of boxes installed. For example VAV1, VAV2, VAV3...VAV25 until all boxes have a unique sequence number.</p>				
<p>## --- replace with the room where the thermostat is located. For example 2006, M30, HALL101, etc.</p>				
<p>### --- replace with the room where the thermostat is located with 'RM' preceding room number where applicable. For example RM 2006, RM M30, HALL101, etc.</p>				
<p>Controller Name: NAENumber_TrunkNumberEquipmentType_# For example 72_1VAV1</p>				
<p>Controller Extended Label: NAENumber_TrunkNumberControllerTypeControllerAddress For example 72_1VMA15</p>				
<p>Controller Description: ##### Controller Name Extended Label ##### --- replace with areas served by the equipment. For example RM 1001-5, RM 2006, RM 102A&B, etc.</p>				
<p>In this example UCT is the building name</p>				

END OF SECTION 23 09 23

SECTION 23 20 10– PIPING, VALVES AND FITTINGS

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

- A. Pipe and Pipe Fittings
- B. Valves

1.3 RELATED SECTIONS

- A. Division 08 – Access Doors and Frames
- B. Division 09 – Painting
- C. Section 23 05 16 – Expansion Compensation
- D. Section 23 05 48 – Vibration Isolation
- E. Section 23 07 19 – Piping Insulation

1.4 REFERENCES

- A. ASME – Boiler and Pressure Vessel Code (BPVC)
- B. ASME BPVC Sec. IX – Welding and Brazing Qualifications
- C. ASME B16.1 – Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
- D. ASME B16.3 – Malleable Iron Threaded Fittings: Classes 150 and 300
- E. ASME B16.4 – Grey Iron Threaded Fittings: Classes 125 and 250
- F. ASME B16.5 – Pipe Flanges and Flanged Fittings NPS ½ through 23 Metric/Inch Standard
- G. ASME B16.9 – Factory-Made Wrought Buttwelding Fittings
- H. ASME B16.18 – Copper Alloy Solder Joint Pressure Fittings
- I. ASME B16.22 – Wrought Copper and Bronze Solder-Joint Pressure Fittings
- J. ASME B16.26 – Copper Alloy Fittings for Flared Copper Tubes
- K. ASME B16.34 – Valves Flanged, Threaded, and Welding End
- L. ASME B31.1 – Power Piping
- M. ASME B31.3 – Process Piping

- N. ASME B31.9 – Building Service Piping
- O. ASTM A47 - Ferric Malleable Iron Castings
- P. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- Q. ASTM A105 – Standard Specification for Carbon Steel Forgings for Piping Applications
- R. ASTM A106 – Specification Standard for Seamless Carbon Steel Pipe for High-Temperature Service
- S. ASTM A126 – Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings
- T. ASTM A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe
- U. ASTM A181 – Standard Specification for Carbon Steel Forgings, for General-Purpose Piping
- V. ASTM A182 – Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
- W. ASTM A234 - Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- X. ASTM B16 – Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
- Y. ASTM B32 – Standard Specification for Solder Metal
- Z. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes
- AA. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes
- BB. for Steam or Valve Bronze Castings
- CC. ASTM B75 - Standard Specification for Seamless Copper Tube
- DD. ASTM B88 - Standard Specification for Seamless Copper Water Tube
- EE. ASTM B99 – Standard Specification for Copper-Silicon Alloy Wire for General Applications
- FF. ASTM B148 – Standard Specification for Aluminum-Bronze Sand Castings
- GG. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
- HH. ASTM B302 – Standard Specification for Threadless Copper Pipe (TP), Standard Sizes
- II. AAA.AWS A5.8 - Brazing Filler Metal.
- JJ. MSS SP-25 – Standard Marking System for Valves, Fittings, Flanges, and Unions
- KK. NCPWB - Procedure Specifications for Pipe Welding

1.5 SUBMITTALS

- A. Submit under provisions of Section 23 00 00.

- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 23 00 00.
- B. Record actual locations of valves, etc. and prepare valve charts.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 23 00 00.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welder's Certification: In accordance with ASME BPVC Sec. IX. Submit welder's certifications prior to any shop or field fabrication. Welder's certifications shall be current within six months of submission.
- D. Maintain one copy of each document on site.

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years' documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum of three years' documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

1.12 EXTRA MATERIALS

- A. Furnish under provisions of Section 23 00 00.

- B. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 STEEL PIPING:

- A. Section applies to all piping systems providing for welded piping, fittings, and other appurtenances. Specific systems requiring welded piping include, but are not limited to: chilled water, hot water, steam, and steam condensate.
- B. Pipe: Unless otherwise indicated, chiller and boiler plant piping shall be Schedule 40, and underground and building piping shall be Standard weight, Grade A or B, seamless black steel pipe conforming in all details to Standard ASTM Designation A53, A106, and A135, latest revisions. Steam condensate shall be Schedule 80.
- C. Fittings:
 - 1. All weld fittings shall be domestic made wrought carbon steel butt-welding fittings conforming to ASTM A234 and ASME/ANSI B16.9, latest edition, as made by Weldbend, Tube Turns, or Hackney Ladish Inc. Attach only to pipe with a hole for the entire length. Each fitting shall be stamped as specified by ASME/ANSI B16.9 and, in addition, shall have the laboratory control number metal stenciled on each fitting for ready reference as to physical properties required for any fittings selected at random. Fittings which have been machined, remarked, printed, or otherwise produced domestically from non-domestic forgings or materials will not be acceptable. Each fitting is to be marked in accordance with MSS SP-25. Markings shall be placed on the fittings at the farthest point from the edge to be welded to prevent disfiguring from the welding process. Submittal data for these fittings shall include a letter signed by an official of the manufacturing firm certifying compliance with these specifications.
 - 2. All screwed pattern fittings specifically called for shall be Class 150 malleable iron fittings of Grinnell Company, Crane Company, or Walworth Company manufacture (Class 300 for unions).
- D. Fabrication:
 - 1. Piping shall be fabricated according to the latest ASME/ANSI B31 Code for Pressure Piping. Welded piping and fittings in chiller and boiler plants shall be fabricated in accordance with ASME/ANSI Standard B31.1 – Power Piping. Direct buried piping mains shall be fabricated in accordance with ASME/ANSI Standard B31.3 – Process Piping. Standard B31.9 – Building Services Piping may be used within buildings. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.
 - 2. Ensure complete penetration of deposited metal with base metal in welds. Contractor shall provide filler metal suitable for use with base metal. Contractor shall keep inside of fittings free from globules of weld metal. All welded pipe joints shall be made by the fusion welding process, employing a metallic arc or gas welding process. All pipe shall have the ends beveled 37-1/2 degrees and all joints shall be aligned true before welding. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size, and the like shall be made with factory-fabricated welding fittings. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

3. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.
4. Do not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.
5. Do not split, bend, flatten or otherwise damage piping before, during or after installation.
6. Remove dirt, scale and other foreign matter from the inside of piping, by swabbing or flushing, prior to the connection of other piping sections, fittings, valves or equipment.
7. In no cases shall Schedule 40 pipe be welded with less than three passes, including one stringer/root, one filler, and one lacer. Schedule 80 pipe shall be welded with not less than four passes including one stringer/root, two filler, and one lacer. In all cases, the weld must be filled before the cap weld is added.
8. Procedure of Assembling Screw Pipe Fittings: All screw joints shall be made with taper threads properly cut. Joints shall be made tight with Teflon applied to the pipe threads only and not to fittings. When threads are cut on pipes, the ends shall be carefully reamed to remove any burrs. Before installing pipe that has been cut and threaded, the lengths of pipe shall be upended and hammered to remove all shavings and foreign material.

E. Weld Testing:

1. All welds are subject to inspection, visual, X-ray and/or Ultrasound, for compliance with specifications. The owner will, at the owner's option, provide employees or employ a testing laboratory for the purposes of performing said inspections and/or X-ray testing. Initial visual and X-ray inspections will be provided by the owner. The contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and re-testing of any welds found to be unacceptable. In addition, the contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1, B31.3, and B31.9, due to the discovery of poor, unacceptable, or rejected welds.
2. Welds lacking penetration, containing excessive porosity or cracks, or found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the ASME/ANSI B31 Code for Pressure Piping, current edition.

2.2 VALVES:

- A. All valves must be of threaded or flanged type. No solder connected or grooved fitting valves shall be used on this project. All valves shall be located such that the removal of their bonnets is possible. All flanged valves shown in horizontal lines with the valve stem in a horizontal position shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance. Valves shall be installed as nearly as possible to the locations indicated in the Construction Drawings. Any change in valve location must be so indicated on the Record Drawings.

- B. All bronze and iron body gate and globe valves shall be the product of one manufacturer for each project. Manufacturers of other types may not be mixed on the same project; i.e., all butterfly valves shall be of the same manufacturer, all ball valves shall be of the same manufacture, etc.
- C. All bronze valves used in circulating systems and steam systems (low and medium pressure) shall be Class 150 SWP. Bronze valves used in high pressure steam systems shall be Class 300 SWP. Iron valves used for low and medium pressure steam systems shall be Class 125. Iron valves used for high pressure steam systems shall be Class 250. [Austin Campus Only: Gate valves 2" or smaller used in low pressure steam systems shall be Class 300 SWP. Gate valves 2 1/2" or larger used in low pressure steam systems shall be Class 150.]
- D. All gate and globe valves shall be union bonnet design.
- E. Metal used in the stems of all bronze gate, globe and angle valves shall conform to ASTM B371 Alloy 694, ASTM B99 Alloy 651, or other corrosion resistant equivalents. Written approvals must be secured for the use of alternative materials. Alloys used in all bronze ball, gate, globe, check, or angle valves shall contain no more than 15% zinc. No yellow brass valves will be allowed.
- F. Class 300 valves shall be constructed of all ASTM B61 composition.
- G. All iron body valves shall have the pressure containing parts constructed of ASTM A126 class B iron. Stem material shall meet ASTM B16 Alloy 360, ASTM 371 Alloy 876 silicon bronze, ASTM B584, or their equivalent. Gates and globes shall be bolted bonnet with OS&Y (outside screw and yoke) and rising stem design. A lubrication fitting is preferred on yoke cap for maintenance lubrication of the yoke bushing. [Austin Campus only: All iron body gate valves shall have the body constructed of ASTM A395 ductile iron.]
- H. All cast steel body valves shall have the pressure containing parts constructed of ASTM A216-GR-WCB carbon steel. Gate and globe valves shall be bolted bonnet outside and screw and yoke design with pressure-temperature rating conforming to ANSI B16.34. Stems shall meet ASTM designation A182-F6 chromium stainless steel. Wedges on gate valves may be solid or flexible type and shall meet ASTM A182-F6 chromium stainless steel on valves from 2" to 6". Sizes 8" and larger may be A216-WCB with forged rings or overlay equal to 182-F6. Seat ring shall be hard faced carbon steel or 13% chromium A182-F6 stainless. Handwheels shall be A47 Grade 35018 malleable iron or ductile iron ASTM A536.
- I. All forged steel body valves shall have the pressure containing parts constructed of ASTM A105, grade 2 forged carbon steel. Seat and wedges shall meet ASTM A182-F6 chromium stainless steel. Seat rings shall be hard faced. Valves shall conform to ANSI B16.34 pressure-temperature rating.
- J. All valves shall be repackable under pressure, with the valve in the full open position. All gate valves, globe valves, angle valves and shutoff valves of every character shall have malleable iron hand wheels, except iron body valves 2-1/2" and larger which may have either malleable iron or ASTM A126 Class B, gray iron hand wheels.
- K. Packing for all valves shall be free of asbestos fibers and selected for the pressure-temperature service of the valve. It is incumbent upon the manufacturer to select the best quality standard packing for the intended valve service. At the end of one year, period spot checks will be made, and should the packing show signs of hardening or causing stem corrosion, then all valves supplied by the manufacturer shall be repacked by the Contractor, at no expense to the Owner, with a packing material selected by the Owner.

Valves 12" and larger located with stem in horizontal position shall be drilled and tapped in accordance with MSS-SP-45 to accommodate a drain valve and equalizing by-pass valve assembly.

- L. Balancing and/or shutoff valves for hot water systems 2" inches and smaller shall be three piece, full port, bronze body ball valves with stainless steel ball and stem. They shall have PTFE seats, packing and gasket, bronze gland follower, adjustable stuffing box, steel lever type handle with plastic sheathed operating handle, adjustable memory stops, and shall be class 150 SWP/600 WOG, screwed pattern. Manufacturer shall certify ball valves for use in throttling service. Stem extensions shall be furnished for use on insulated lines.
- M. Shutoff valves for chilled water 2" and smaller shall be two piece, full port, bronze body ball valves with stainless steel ball and stem. They shall have PTFE seats, packing and gasket, bronze gland follower, adjustable stuffing box, steel lever type handle with plastic sheathed operating handle, adjustable memory stops, and shall be class 150 SWP/600 WOG, screwed pattern. Manufacturer shall certify ball valves for use in throttling service. Stem extensions shall be furnished for use on insulated lines.
- N. All balancing and/or shutoff valves 2 1/2" and larger shall be tapped full lug butterfly valves with aluminum bronze discs of ASTM B148 Alloy C955 and 316, 416, or 420 stainless steel shafts. Design must incorporate bushing between shafts and body of material suitable to provide a bearing surface to eliminate seizing or galling.
- O. All balancing and/or shutoff valves must be capable of providing a bubble tight seal at 200 psi for valves up to 12", and 150 psi for larger valves, when used for end of line service, without requiring the installation of a blind flange on the downstream side.
- P. All butterfly valves shall be absolutely tight against a pressure differential of 150 psi. Liners shall be resilient material suitable for 225 °F temperature and bodies of ductile iron. Butterfly valves 2 1/2" through 6" shall have lever handles which can be set in interim positions between full open and full closed. Butterfly valves 8" and larger, and butterfly valves used for balancing service, regardless of size, shall have heavy duty weather proof encased gear operators with malleable iron handwheel or crank.
- Q. Check Valves for Water Systems: Valves 2" and smaller shall have bronze bodies and a regrinding disc and seat with screw-in cap. Valves 2 1/2" and larger shall have iron bodies and be non-slam wafer type with stainless pins and springs, and bronze or stainless steel plates.

2.3 STANDARDS OF QUALITY FOR VALVES:

Size	Service	Media	Class	Milwaukee	Nibco	Crane Co. Stockham or as noted
2" & smaller	Check Valve	All Water Systems	150	510T	T-433-Y	B-345
2-1/2" & larger	Check Valve	All Water Systems	125	8800*	W-920-W	Crane "Duo-Chek" Series

* Requires extended stem in insulated lines.

- 1. Note: Valves 8" and larger, and valves used for balancing service regardless of size, shall have heavy-duty weatherproof encased gear operators.

2.4 UNIONS:

- A. Provide and install two-piece unions at proper points to permit removal of pipe, valves and various equipment and/or machinery items without injury to other parts of the system. No unions will be required in welded lines or lines assembled with solder joint fittings except at all valves, equipment

items, machinery items and other special pieces of apparatus. Unions 2" and smaller in ferrous lines shall be Class 300 AAR malleable iron unions with iron to brass seats, and 2 1/2" and larger shall be ground flange unions. Unions in copper lines shall be Class 125 ground joint brass unions or Class 150 brass flanges if required by the mating item of equipment. Companion flanges on lines at various items of equipment, machines and pieces of apparatus shall serve as unions to permit removal of the particular items. See particular Specifications for special fittings and pressure.

- B. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type equal to EPCO.
- C. In all water lines where the material of the pipe is changed from ferrous to copper or brass, a two-piece dielectric union shall be used at the transition.

2.5 FLANGES:

- A. All 150 lb. and 300 lb. ANSI flanges shall be weld neck and shall be domestically manufactured, forged carbon steel, conforming to ANSI B16.5 and ASTM A181 Grade I or II or ASTM A105-71 as made by Tube Turns or Hackney Ladish Inc. Slip on flanges shall not be used. Each fitting shall be stamped as specified by ANSI B16.9, and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer's trademark permanently identified in accordance with MSS SP-25. Contractor shall submit data for firm certifying compliance with these Specifications. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. Allthread rods will not be an acceptable for flange bolts. Steam system flange bolts shall have a tensile strength of 105,000 psi and an elastic limit of 81,000 psi and be rated at least ANSI Grade V. Other bolts shall have a tensile strength of 80,000 psi and an elastic limit of 36,000 psi and be rated at least ANSI Grade I.
- B. Flat faced flanges shall be furnished to match 125 lb cast iron flanges on pumps, check valves, strainers, etc. with full flange gaskets. Bolting of raised face flanges to flat faced flanges is not allowed.
- C. Flange Gaskets
 - 1. Gaskets shall be placed between the flanges of all flanged joints.
 - 2. Gaskets for steam piping - All steam flange joints shall use Flexitallic Class 150 spiral wound for low pressure applications and Flexitallic Class 300 spiral wound gaskets for medium or high pressure applications. Raised and flat face flange gaskets shall be Flexitallic compression gauge (CG) style. External ring shall be Type 304 stainless steel and color coded yellow. Filler material shall be Flexite Super and color coded with pink stripe. Equivalentents may be submitted with all design data so that an evaluation of the gasket can be made.
 - 3. Gaskets for all other applications: Gaskets shall be ring form gaskets fitting within the bolt circle of their respective flanges. Gaskets shall be 1/16" thick asbestos free material recommended for service by Anchor, Garlock, or John Crane. The inside diameter of such gaskets shall conform to the nominal pipe size and the outside diameter shall be such that the gasket extends outward to the studs or bolts employed in the flanged joint.
 - 4. Spares - Contractor shall provide ten spares for every flange size and rating.
- D. Flange Bolt Installation:

1. Bolt Lubrication: Bolts shall be well lubricated with a heavy graphite and oil mixture.
2. Torque Requirements - Bolts shall be stressed to 45,000 psi.

Nominal Bolt Dia. (Inch)	Torque (Foot-Pounds)
0.25	6
0.3125	12
0.375	18
0.4375	30
0.5	45
0.5625	68
0.625	90
0.75	150
0.875	240
1.0	368
1.125	533
1.25	750
1.375	1020
1.5	1200

3. Torque shall be checked with a calibrated breaking action torque wrench on the final torque round. Bolts shall be cold and hot torqued.
4. Torque Pattern - Shall be a cross or star pattern with at least four passes. Limit each pass to 30% of full torque increases.
5. Hot Torque - Re-torque the flange bolts with system at normal operating pressure and temperature for at least four hours.
6. Inspection - Owner shall verify hot torquing of all medium and high pressure steam flange bolts.

PART 3 - EXECUTION

Refer to other Sections for service specific requirements.

3.1 EXAMINATION

- A. Verify excavations under provisions of Section 23 00 00.
- B. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.

- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed. Coordinate access door location with architectural features.
- H. Establish elevations of buried piping outside the building to ensure a minimum of cover. Refer to Section 23 00 00.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting. Refer to Division 09.
- L. Excavate in accordance with Section 23 00 00 for work of this Section.
- M. Backfill in accordance with Section 23 00 00 for work of this Section.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted.

3.4 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/8 inch per foot (one percent) minimum. Maintain gradients through each joint of pipe and throughout system.
- B. Slope water piping and arrange to drain at low points.

END OF SECTION 23 20 00.A

SECTION 23 29 23 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

- A. Variable Frequency Drives

1.3 RELATED SECTIONS

- A. Section 23 05 13 - Motors
- B. Section 23 05 48 - Vibration Isolation
- C. Section 23 09 23 – Direct Digital Control Systems
- D. Section 23 09 93 – Sequence of Operation
- E. Section 23 32 13 – Air Cooled Split System Air Conditioning Units
- F. Section 26 05 19 - Cable, Wire and Connectors, 600 Volt
- G. Section 26 27 26 - Wiring Devices and Floor Boxes

1.4 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings
- C. AMCA 99 - Standards Handbook
- D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
- E. AMCA 300 - Test Code for Sound Rating Air Moving Devices
- F. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices
- G. NEMA MG1 - Motors and Generators
- H. NFPA 70 - National Electrical Code
- I. IEEE - 112B, 587 and 519

1.5 SUBMITTALS

- A. Submit complete product data, shop drawings, and wiring diagrams, including the rated input current of the VFD. Data shall clearly indicate the current distortion produced by the VFD

(submittal will not be approved prior to receiving this information). See paragraph 2.2E for requirements. Make submittals under the provisions of Section 23 00 00 and Division 01.

1. Where IEEE 519 analysis indicates that a 6 pulse VFD will satisfy the requirements specified within this section, Contractor shall submit request to use 6 pulse VFD. Contractor is to include credit for using a 6 pulse rather than 12 pulse VFD in submittal.

B. Product Data:

1. Provide literature that indicates dimensions, weights, capacities, performance, gages and finishes of materials, and electrical characteristics and connection requirements.
2. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory installed and field installed wiring. Coordinate submittal with Direct Digital Controls supplier for interface with building control system.
3. Ratings, including voltage and continuous current and horsepower.

C. Shop Drawings:

1. Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
2. Dimensioned drawings. Outline dimensional drawings of each size and type of variable frequency drive (VFD) proposed for use on this project. Include top and bottom views showing conduit entry and exit space, front and side elevations showing arrangement of devices, ventilation and cooling provisions, required clearances, connection details, and mounting provisions.

D. Prior to Installation, Startup, and Testing:

1. Submit manufacturer's written installation instructions.
2. Submit written procedures for field testing to be performed under Part 3 of this Section. Procedures shall include prerequisite and initial conditions, a list of required test instruments, and forms for documentation of test results. Testing forms shall include the range of acceptance values for each recorded parameter.

E. Following Installation, Startup, and Testing. Submit the following information for record purposes in accordance with the requirements of Division 01, Submittals, prior to Owner acceptance.

1. Records. Final as-built drawings and information for items listed in paragraph 1.5B and 1.5C, this Section.
2. Certified factory production test reports, as specified in Part 3, this Section.
3. Manufacturer's Field Start-up Report and Certification, as specified in Part 3, this Section.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 23 00 00.
- B. Maintenance Data: Include instructions for routine service, spare parts lists, and wiring diagrams.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience, who issues complete catalog data on total product.

1.8 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. UL Compliance:
 - 1. Comply with UL 508,
 - 2. Comply with UL 60947-4-1A for Motor Starters and Contactors.
- C. IEEE Compliance:
 - 1. Comply with IEEE 112-B, Test Procedure for Polyphase Induction Motors and Generators.
 - 2. Comply with IEEE 519, Harmonic Control in Electrical Power Systems.
 - 3. Comply with ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.
- D. NEMA Compliance:
 - 1. Comply with NEMA ICS 7.0, AC Adjustable Speed Drives.
 - 2. Comply with NEMA MG-1 for Motors.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.
- B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.10 SCHEDULES ON DRAWINGS:

- A. In general, all capacities of equipment and electrical characteristics are shown in schedules on the Drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in the capacities of the scheduled equipment supplied under this contract will be permitted only with the written direction of the owner. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Where installation instructions are not included in these Specifications or on the Drawings, the manufacturer's instructions shall be followed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. ABB
- B. Emerson
- C. Rockwell Automation (Reliance)

- D. Eaton
- E. MagneTek
- F. Siemens Robicon
- G. Danfoss Graham
- H. Yaskawa
- I. Substitutions: Under provisions of Section 23 00 00. The equipment as supplied by any of the acceptable manufacturers or an approved equal shall comply with all of the provisions of this specification.

2.2 GENERAL

- A. The variable frequency drive (VFD) motor controller shall convert 208, 480 Volt, three-phase, 60 Hertz power to adjustable voltage (0 - 480V) and frequency (20 - 65 Hz.) three-phase, AC power for stepless motor speed control with a capability of 10:1 speed reduction.
- B. The adjustable frequency controller shall be a space vector sine-coded Pulse-Width Modulated (PWM) or IGBT design. Modulation methods which incorporate "gear-changing" techniques are not acceptable.
- C. The controller shall be suitable for use with any standard NEMA-B squirrel-cage induction motor(s) having a 1.15 Service Factor. At any time in the future, it shall be possible to substitute any standard motor (equivalent horsepower, voltage and RPM) in the field.
- D. The variable frequency control shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when other VFD's are operated from the same bus.
- E. Individual or simultaneous operation of VFD's shall not add more than 5 percent total harmonic voltage distortion and no more than 5 percent total harmonic current distortion (per IEEE 519) to the normal bus.
 - 1. VFD manufacturer shall perform harmonic analysis based on the electrical one-line diagram. The VFD manufacturer shall provide calculations specific to this installation, showing total harmonic voltage distortion is less than 5 percent.
 - 2. Input line filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with IEEE Standard 519. The resultant power factor with the addition of the filter shall be a minimum of 97%. All VFD's shall include a minimum of 5 percent impedance reactors, no exceptions.
 - 3. The VFD shall be provided with a harmonic filter that limits the current distortion to 5% or less. Assume a 98% power factor and nominal voltage and frequency for input conditions.
 - 4. Contractor shall include base bid pricing for 12 pulse VFD as well as deduct pricing for 6 pulse VFD in bid.
- F. The VFD shall be provided with a DDC System Interface/Siemens Apogee FLN Protocol Interface.

- G. The VFD shall include RFI/EMI filters to prevent high frequency noise interference from migrating back onto the power system and RFI interference with other equipment.

2.3 SCHEDULE

- A. In general, capacities of equipment and electrical characteristics are shown in schedules on the Drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in the capacities of the scheduled equipment supplied under this contract will be permitted only with the written direction of the Owner.
- B. Where rating of driven equipment furnished for this project is larger than scheduled or indicated on Drawings, provide variable speed drive suitable for driven equipment. Coordinate submittal data and unit selections with submittal data for driven equipment.
- C. Provide VFDs as follows unless otherwise specified on the equipment schedule:
 - 1. For equipment that is redundant provide VFD without a constant speed bypass.
 - 2. For equipment that is not redundant provide VFD with a constant speed bypass.

2.4 BASIC DESCRIPTION

- A. The controller shall produce an adjustable AC voltage/frequency output. It shall have an output voltage regulator to maintain correct output V/Hz. despite incoming voltage variations.
- B. The controller shall have a continuous output current rating of 100 percent of motor nameplate current.
- C. The VFD shall be of the Pulse-Width Modulated type and shall consist of a full-wave diode bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. The Pulse Width Modulation strategy shall be of the space vector type implemented in a microprocessor which generates a sine-coded output voltage. The inverter output shall be generated by Darlingon power transistors which shall be controlled by six identical base driver circuits. The VFD shall not induce excessive power losses in the motor. The worst case RMS motor line current measured at rated speed, torque and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine wave operation. The drive shall produce an output volts/Hertz pattern to produce adequate starting torque under all conditions and operate smoothly at all operating speeds on variable torque load.

2.5 FEATURES

- A. The door of each power unit shall include a "POWER ON" light, a VFD fault light, a VFD run light, stop pushbutton, start pushbutton, a fault reset pushbutton, a "HAND-OFF-AUTOMATIC" selector switch, and a manual speed control potentiometer.
- B. The VFD shall be software programmable to provide automatic restart after any individual trip condition resulting from overcurrent, overvoltage, undervoltage, or overtemperature. For safety, the drive shall shut down and require manual reset and restart if the automatic reset/restart function is not successful within a maximum of three attempts within a short time period.
- C. A speed droop feature shall be included which reduces the speed of the drive on transient overloads. The drive is to return to set speed after transient is removed. If the acceleration or deceleration rates are too rapid for the moment of inertia of the load, the drive is to automatically compensate to prevent drive trip.
- D. Automatic restart after drive trip or utility failure, software selectable.

- E. Speed profile. Individual adjustable settings for start, stop, entry, slope, and minimum and maximum speed points.
- F. Process signal inverter. Software selectable to allow speed of drive to vary inversely with input signal.
- G. A critical speed avoidance circuit will be included for selection of at least three critical speeds with a rejection band centered on that speed. The drive will ignore any speed signals requiring drive operation within the rejection band.
- H. Proportional and integral setpoint process controller with menu driven selection and programming via door-mounted keypad.
- I. Pick up a spinning load. The VFD shall be able to determine the motor speed and resume control of a motor which is spinning in either direction without tripping.
- J. A door-mounted membrane keypad with integral 2-line, 24-character LCD display shall be furnished, capable of controlling the VFD and setting drive parameters, and shall include the following features:
 - 1. The digital display must present all diagnostic message and parameter values in English engineering units when accessed, without the use of codes.
 - 2. The digital keypad shall allow the operator to enter exact numerical settings in English engineering units. A plain English user menu shall be provided in software as a guide to parameter setting, (rather than codes). Drive parameters shall be factory set in EEPROM and resettable in the field through the keypad. Means of password security shall be available to protect drive parameters from unauthorized personnel. The EEPROM stored drive variables must be able to be transferred to new boards to reprogram spare boards.
- K. Input circuit breaker, interlocked with the enclosure door, with through-the-door handle to provide positive disconnect of incoming AC power.
- L. Constant speed bypass shall be provided to allow the motor to run across the line in the event of VFD shutdown. The transfer from the VFD to the line shall be accomplished manually by means of a selector switch. The bypass circuitry shall be enclosed separate from the VFD in a NEMA-1 cabinet.
- M. The bypass cabinet shall include a door-interlocked input circuit breaker, a VFD output contactor, a full-voltage starting contactor (both contactors electrically interlocked), a thermal overload relay to provide motor protection, a phase loss/undervoltage relay and a control power transformer. Mounted on the cabinet door shall be a two line LCD display to indicate status of the bypass operation (i.e. VFD output contactor failure or bypass contactor failure, etc), VFD bypass selector switch, motor fault light, power "ON" light, motor "ON" VFD light, and motor "ON LINE" light. The VFD shall be provided with a BacNet Protocol interface. The bypass shall have four digital inputs for individual safety interlocks and provide voltage and current reading on all 3 phases as well as KW.
- N. The drive shall be provided with two isolated form C alarm contacts to indicate VFD failure and run status to the DDC.
- O. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
- P. Drives serving cooling tower fans shall have the ability to provide a blade breaking load to prevent the cooling tower fan from spinning backwards.

- Q. Digital display indication of:
1. Speed demand in percent.
 2. Output current in amperes.
 3. Frequency in Hertz or RPM.
 4. Control Mode: Manual/Automatic.
 5. Total three-phase KW or output voltage.
- R. At the factory with compatible motor, provide at least three lock-out ranges (50 rpm maximum each), two of which can be used to correct any run test problems.

2.6 SERVICE CONDITIONS

- A. The controller shall be designed and constructed to operate within the following service conditions:
1. Elevation. To 3300 Feet.
 2. Ambient Temperature Range. 0°C to 40°C.
 3. Atmosphere. Non-Condensing relative humidity to 95 percent.
 4. AC Line Voltage Variation. -30 percent to +10 percent.
 5. AC Line Frequency Variation. 3 Hertz.
 6. Output Frequency. Shall be able to operate at the rated motor horsepower up to 90 hertz without damage to the VFD.

2.7 ENCLOSURE

- A. VFD components shall be factory mounted and wired on a dead front, grounded, NEMA-12 enclosure. Enclosure shall be UL listed as a plenum rated VFD.
- B. Finish. Apply a finish to enclosure cabinet, trim, and doors. Exterior and interior metal surfaces shall be cleaned and finished with electrostatically applied "powder coat" thermoset enamel baked over a rust-inhibiting phosphatized coating.

2.8 PROTECTIVE FEATURES AND CIRCUITS

- A. The controller shall include the following protective features:
1. Single phase fault or 3-phase short circuit on VFD output terminals without damage to any power component.
 2. Static instantaneous overcurrent and overvoltage trip with inverse overcurrent protection.
 3. Static over speed (over frequency) protection.
 4. Line loss and undervoltage protection.
 5. Power unit overtemperature protection.
 6. Electronic motor overload protection.

7. Responsive action to motor winding temperature detectors or thermostatic switches.
8. Isolated operator controls.
9. Input line circuit breakers.
10. Be insensitive to incoming power phase sequence.
11. Have desaturation circuit to drive inverter section transistor base current to zero in event of controller fault.
12. Have DC bus discharge circuit for protection of operator and service personnel with an indicator lamp.
13. Input line noise suppression with line reactor.
14. Individual transistor overcurrent protection.

2.9 PARAMETER SETTINGS

- A. The following system configuring settings shall be provided, without exception, field adjustable through the keypad/display unit or via the serial communication port only.
- B. Motor Nameplate Data:
 1. Motor frequency.
 2. Number of poles.
 3. Full load speed.
 4. Motor voltage.
 5. Motor full load amps (FLA).
 6. Motor KW.
 7. Current minimum.
 8. Current maximum.
- C. VFD Limits:
 1. Independent accel/decel rates.
 2. No load boost.
 3. Vmin, Vmax, V/Hz.
 4. Full load boost.
 5. Overload trip curve select (Inverse or Constant).
 6. Min/Max speed (frequency).
 7. Auto reset for load or voltage trip select.
 8. Slip compensation.

9. Catch-A Spinning-Load select.
10. Overload trip time set.
- D. VFD Parameters:
 1. Voltage loop gain.
 2. Voltage loop stability.
 3. Current loop stability.
- E. Controller Adjustments:
 1. PID control enable/disable.
 2. Setpoint select.
 3. Proportional band select.
 4. Reset time select.
 5. Rate time select.
 6. Input signal scaling.
 7. Input signal select (4-20mA).
 8. Auto start functions: On/Off, Delay On/Off, Level Select On/Off.
 9. Speed Profile: Entry, Exit, Point Select.
 10. Min, Max Speed Select.
 11. Inverse profile select (allows VFD speed to vary directly or inversely with input signal.)

2.10 DIAGNOSTIC FEATURES AND FAULT HANDLING

- A. The VFD shall include a comprehensive microprocessor based digital diagnostic system which monitors its own control functions and displays faults and operating conditions. Microprocessor systems must be products of the same manufacturer as the VFD (to assure single source responsibility, availability of service and access to spare parts).
- B. A "FAULT LOG" shall record, store, display and print upon demand, the following for the 3 most recent events:
 1. VFD mode (Auto/Manual).
 2. Date and Time stamped for each fault
 3. Elapsed time (since previous fault).
 4. Type of fault.
 5. Reset mode (Auto/Manual).
- C. A "HISTORIC LOG" shall record, store, display and print upon demand, the following control variables at 2.7 M/Sec. intervals for the 10 intervals immediately preceding a fault trip:

1. VFD mode (manual/auto/inhibited/tripped/etc.).
 2. Speed demand.
 3. VFD output frequency.
 4. Drive inhibit (On/Off).
 5. Feedback (motor) Amps.
 6. VFD output voltage.
 7. Type of fault:
 - a. Inverter O/Temp.
 - b. Over Voltage.
 - c. Detection Error.
 - d. Earth Leakage.
 - e. Watchdog.
 - f. PSU Power Fail.
 - g. Manual Test.
 - h. Out of Sat 1-6.
 - i. Software Fault.
 - j. Waveform Gen.
 - k. Remote Watchdog.
 - l. Thermistor.
 - m. Sustained O/L.
 - n. Bypass SCR Trip.
- D. The fault log record shall be accessible via a RS485 serial link as well as line by line on the keypad display.

2.11 SYSTEM OPERATION

- A. With the H-O-A switch in the "HAND" position, the drive shall be controlled by the manual speed potentiometer on the drive door.
- B. With the H-O-A switch in "AUTOMATIC", the drive shall start remotely through the EMS and its speed shall be controlled by a 4-20mA, internally isolated signal from the local Powers Control Panel.
- C. With the H-O-A switch in the "OFF" position, the run circuit will be open and the VFD will not operate.

2.12 QUALITY ASSURANCE AND FACTORY TESTS

- A. The controller shall be subject to, but not limited to, the following quality assurance controls, procedures and tests:
 - 1. Power transistors, SCR's and diodes shall be tested to ensure correct function and highest reliability.
 - 2. Controller will be functionally tested with a motor to ensure that if the drive is started up according to the instruction manual provided, the unit will run properly.
- B. Manufacture of VFD shall certify in shop drawings that VFD and equipment motors are compatible. Contractor shall provide VFD manufacturer complete motor data prior to submittal of shop drawings.
- C. Manufacturer shall provide a 3 year warranty on parts and labor to owner for each VFD from date of acceptance by Owner.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under the provisions of Section 23 00 00.
- B. Deliver products on site in factory fabricated protective containers, with factory installed shipping skids and lifting lugs. Inspect for damage.
- C. Store in clean dry place, elevated above grade, and protected from weather, sunlight, dirt, moisture, corrosion, and construction traffic.
- D. Handle carefully to avoid damage to components, enclosures, and finish. Use only lifting eyes and brackets provided for that purpose. Damaged products shall be rejected and shall not be installed on the project.
- E. The manufacturer's representative shall provide a list of recommended spare parts.
- F. The manufacturer's representative shall provide terminal block to terminal block wiring diagrams coordinated with the owner to provide a complete and functional operating system. Furnish detailed drawings showing construction, dimensions, wiring diagrams and installation procedures for engineer's approval.
- G. As part of the purchase price and agreement, a full, unconditional, one (1) year warranty on all parts and labor shall be provided. The warranty shall include all parts, labor, shipping, field service or technician time, labor or travel expenses and verbal or written correspondence with the VFD manufacturer or his representatives, including that which might be incidental to the proper installation and operation of the equipment.

3.2 PREPARATION

- A. Verify that surfaces are ready to receive Work.
- B. Verify that field measurements are as shown on Shop Drawings and as instructed by manufacturer.
- C. Verify that required utilities are available, in the proper location, and ready for use.

3.3 INSTALLATION

- A. Install VFD in accordance with manufacturer's published, printed instructions.

- B. Mounting: VFD's shall be wall hung units. Contractor shall provide Unistrut mounting bracket for drives. Contractor shall reinforce the wall studs with bracing as required to adequately support the drive. Installation of the VFD shall allow for clearance in front of the drive as required by the latest revision of the National Electric Code for an electrical panel.
 - 1. Mount VFD on Unistrut frame anchored to 4-inch thick concrete pad. Do not mount VFD on wall.
 - 2. Height. In general, mount units so that operating handle is approximately 60 inches above finished floor. Where grouped, align tops of units.
 - 3. Ensure that proper clearance is provided for enclosure as required per NEC Table 110.26(A)(1) for working clearance and dedicated equipment space. Ensure that proper clearance is provided for enclosure as required by manufacturer for proper cooling of VFD.
- C. Coordinate with Division 26 to complete raceway, power wiring, and grounding in accordance with the requirements of the NEC and the recommendations of the VFD manufacturer as outlined in the installation manual.
- D. Contractor shall verify the existence and proper installation and operation of auxiliary contact on all disconnects located between the load and the drive. Auxiliary contact shall command the VFD to shut down as required to protect the VFD from damage. Any disconnects found lacking this function shall be corrected prior to the startup of the equipment.
- E. Interface:
 - 1. Controls. Coordinate with the controls supplier to accomplish proper interface with the building automation system (BAS) direct digital controls (DDC). Refer to Division 23 for Direct Digital Controls.
 - 2. Fire Alarm. Coordinate with Division 28 and the fire alarm supplier to accomplish proper interface with the fire alarm system, as indicated on the Drawings. Refer to Division 28, Fire Alarm System.
 - 3. Shutdown. Coordinate with other divisions to accomplish proper interface for shutdown of VFD, as indicated on the Drawings and as specified in the construction documents.
- F. Immediately prior to final acceptance, replace all air filters in VFD.
- G. Manufacturer shall provide start-up services and training as follows:
 - 1. Start-up for Contractor to verify correct installation and proper operation.
 - 2. Start-up for Controls Vendor to verify that VFD correctly responds to control command functions and provides alarm condition to control center.

Provide minimum two-day training, four (4) hours per day for up to twelve (12) people. The course shall be classroom instruction complete with visual aids, documentation, circuit diagrams and hands-on training. This course shall not be construed as a sales meeting, but rather as a school to familiarize the Owner with the care, troubleshooting, and servicing of the VFD.

END OF SECTION 23 29 23

SECTION 23 31 00

DUCTWORK

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification

1.2 WORK INCLUDED

- A. Low Pressure Ducts
- B. Medium and High Pressure Ductwork
- C. Casings
- D. Duct Cleaning

1.3 RELATED WORK

- A. Division 09 Section, Painting, priming or coating of metal ductwork exposed to view.
- B. Section 23 05 48 - Vibration Isolation
- C. Section 23 07 13 - Duct Insulation
- D. Section 23 33 00 - Ductwork Accessories
- E. Section 23 36 00 - Air Terminal Units
- F. Section 23 37 00 - Air Inlets and Outlets
- G. Section 23 05 93.A - Testing, Adjusting and Balancing

1.4 REFERENCES

- A. ASHRAE - Handbook of Fundamentals; Duct Design
- B. ASHRAE - Handbook of HVAC Systems and Equipment; Duct Construction
- C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
- D. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- E. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- F. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality
- G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate

- H. NFPA 45 – Laboratory Ventilating Systems and Hood Requirements
- I. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
- J. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
- K. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooling Equipment
- L. SMACNA – HVAC Duct Construction Standards, 1995
- M. UL 181 - Factory-Made Air Ducts and Connectors
- N. SMACNA Round Industrial Duct Construction Standards,.
- O. Engineering Design Manual for Air Handling Systems, United McGill Corporation (UMC).
- P. Assembly and Installation of Spiral Duct and Fittings, IMC.
- Q. Engineering Report No. 132 (Spacing of Duct Hangers), IMC.
- R. AWS D1.1 American Welding Society Structural Welding Code

1.5 DEFINITIONS

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Low Pressure: 3 inch WG positive or negative static pressure and velocities less than 1,500 fpm.
- C. Medium Pressure: 6 inch WG positive static pressure and velocities greater than 1,500 fpm.
- D. High Pressure: 10 inch WG positive static pressure and velocities greater than 2,500 fpm.

1.6 SUBMITTALS

- A. Product Data
 - 1. Provide product data for all ductwork systems to be used on project. Product data submittals shall include the following as a minimum:
 - a. System name and type
 - b. Duct system design pressure
 - c. Hangers and supports, including materials, fabrication, methods for duct and building attachment.
 - d. Sealant type.
- B. Shop Drawings shall be submitted on all items of sheet metal work specified herein. Shop Drawings of ductwork at air units shall be submitted at a minimum scale of 3/8" equal to one foot. Shop drawings of ductwork located at all other locations shall be prepared at a scale of not less than 1/4" = 1'-0". Reproduction and submittal of the construction documents is not acceptable. Shop drawings shall include the following:
 - 1. Clearance dimensions between ducts and dimensions above finished floors for bottom and tops of ducts.

2. Call out of duct materials other than galvanized including but not limited to stainless steel, aluminum, or prefabricated fire rated ductwork.
 3. Shop Drawings shall indicate location of all supply, return, exhaust and light fixtures from the approved reflected ceiling plans.
 4. Shop drawings shall identify all duct sizes, reinforcement and spacing.
 5. Penetrations through fire rated and other partitions.
 6. Show major equipment with ductwork connections.
- C. Show all dampers, turning vanes, access doors, fire dampers and all other ductwork accessories to be provided. Submit shop drawings and product data under provisions of Section 23 00 00.
- D. Submit two samples of stainless steel welded duct joint to Engineer and Owner for approval. After approval, sample shall remain at job site for reference.
- E. Welding Certificates. Provide for all welders including procedures and standards of acceptance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 23 00 00.
- B. Store and protect products under provisions of Section 23 00 00.

PART 2 - PRODUCTS

2.1 DUCTWORK GENERAL:

- A. All ductwork indicated on the Drawings, specified or required for the air conditioning and ventilating systems shall be of materials as hereinafter specified unless indicated otherwise. All air distribution ductwork shall be fabricated, erected, supported, etc., in accordance with all applicable standards of SMACNA Duct Manuals where such standards do not conflict with NFPA 90A and where class of construction equals or exceeds that noted herein. All exhaust ductwork including toilet room exhausts shall be constructed and leak tested as specified for medium pressure supply ducts at negative pressure.
- B. All ductwork shown on the Drawings, specified or required for the heating, ventilating and air conditioning systems shall be constructed and erected in a first class workmanlike manner. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job against noise, chatter, whistling, vibration, and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall be corrected as directed by the Architect.
- C. All duct sizes shown on the Drawings are air stream sizes. Allowance shall be made for internal lining where required, to provide the required cross sectional area.
- D. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time.
- E. Except for special ducts specified elsewhere herein, all sheet metal used on the project shall be constructed from prime galvanized steel sheets and/or coils up to 60" in width. Each sheet shall be stenciled with manufacturer's name and gauge. Coils of sheet steel shall be stenciled throughout on ten foot (10') centers with manufacturer's name and must be visible after duct is installed. Sheet

metal must conform to SMACNA sheet metal tolerances as outlined in SMACNA's "HVAC Duct Construction Standards."

- F. Where ducts that are exposed to view (including equipment rooms), pass through walls, floors or ceilings, furnish and install sheet metal collars around the duct.

2.2 DUCTWORK LOW PRESSURE: (INCLUDES ALL EXHAUST DUCTWORK DOWNSTREAM OF FANS.)

- A. The scope of low pressure ductwork is defined as all ductwork downstream of terminal units, and all exhaust ductwork downstream of fans. Construction of all low pressure duct shall be in accordance with Low Velocity Duct Construction Standards as published by Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and shall be sealed and tested at 3" static with the same test procedures as medium pressure ductwork.
- B. Spiral wound round duct shall be as manufactured by United McGill Sheet Metal Company or approved equal.
- C. The metal gauges listed in the 1995 SMACNA HVAC Duct Construction Standards for Metal and Flexible Duct are the minimum which shall be used for this project. It shall be noted that the Contractor is responsible that the metal gauge selected is heavy enough to withstand the physical abuse of the installation.
- D. Elbows shall be radius type and have a centerline radius of 1-1/2 times the duct diameter or width. Elbows in round ducts may be smooth radius as described above or 5-piece 90 degree elbows and 3-piece 45 degree elbows. Joints in round ducts shall be slip type with a minimum of three sheet metal screws. Joints in sectional elbows shall be sealed as specified for duct sealing. 90° mitered elbows are not acceptable unless approved by the Architect/Engineer or Project Manager.
- E. SEALANT: All ductwork (except welded exhaust duct) shall be sealed with either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", Polymer Adhesive "Airseal #11", or "United Duct Seal" (United McGill Corp.) water base, latex or acrylic type sealant. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this project. For exterior applications, "Uni-Thane " (United McGill Corp.) polyurethane based sealant shall be used. No other sealants may be used. All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3" wide open weave fiberglass tape. Sufficient additional sealant shall then be applied to completely imbed the cloth. All sealants shall be UL rated at no more than flame spread of 5 and smoke developed of 0. At contractor's option, Hardcast 1602 sealant tape may be used in lap joints and flat seams.

2.3 DUCTWORK MEDIUM PRESSURE: (INCLUDES ALL EXHAUST DUCTWORK UPSTREAM OF FANS).

- A. The scope of medium pressure ductwork is defined as all ductwork downstream of all air handlers, up to and including terminal units, plus all return air ductwork. Construction of all ducts shall be in accordance with High Velocity Construction Standards as published by SMACNA. All round and rectangular duct construction, duct fittings, dampers, etc., are covered in this manual and it is to be adhered to.
1. Spiral wound round duct shall be as manufactured by United McGill Sheet Metal Company or approved equal.
 2. The metal gauges are listed herein for round duct and for rectangular duct.
- B. All ductwork (except welded exhaust duct) shall be sealed with either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", or "United Duct Seal" (United McGill Corp.) water base, latex or acrylic type sealant. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this

project. For exterior applications, "Uni-Thane" (United McGill Corp.) polyurethane based sealant shall be used. No other sealants may be used. All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3" wide open weave fiberglass tape. Sufficient additional sealant shall then be applied to completely imbed the cloth. At contractor's option Hardcast 1602 sealant tape may be used in lap joints and flat seams.

- C. Oval ducts shall be spiral flat oval or welded flat oval equal to those of United McGill Sheet Metal Company with gauges and reinforcing as recommended by the manufacturer for medium pressure or the ducts may be Shop fabricated of completely welded construction of the following gauge:
1. Major Axis 12 to 20 No. 24 gauge
 2. Major Axis 20 to 30 No. 22 gauge
 3. Major Axis 30 to 46 No. 20 gauge
 4. Major Axis 46 to 50 No. 18 gauge
 5. Major Axis 50 and Up No. 16 gauge
- D. Oval fittings shall be equal to those of United McGill Sheet Metal Company with requirements, sealing, etc., similar to that specified for round medium pressure work.
- E. Oval duct reinforcing methods shall be submitted as Shop Drawings for approval. Reinforcing galvanized angles shall be of sizes specified for same size rectangular ducts. Galvanized angles shall be used where standing seams are specified for rectangular ducts. Attaching methods shall be shown on Shop Drawings and submitted for approval.
- F. Testing of Medium Pressure Ductwork: (Includes from fan discharge through to the discharge of terminal units.)
1. All medium pressure ducts shall be pressure tested according to SMACNA Chapter 10 test procedures. Design pressure for testing ductwork shall be six inches (6") of water. Total allowable leakage shall not exceed 1% of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all Sections shall not exceed the total allowable leakage.
 2. The entire system of medium pressure ductwork shall be tested, including the VAV/Constant Volume Terminal Units (i.e. The ductwork shall be capped immediately prior to the Terminal Units, and tested as described above). After testing has proven that the ductwork is installed and performs as specified, the terminal units shall be connected to the ductwork and the connections sealed with extra care. The contractor shall inform the project inspector when the joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage in the terminal unit connections/joints after the systems have been put into service, the leaks shall be repaired by: 1) complete removal of the sealing materials, 2) thorough cleaning of the joint surfaces, and 3) installation of multiple layers of sealing materials.
 3. At the option of the Owner, the Contractor may be allowed to eliminate the terminal units from testing by capping the supply ductwork prior to the terminal units, then inspecting the connection to the terminal units when complete. This option may only be exercised by the Resident Construction Manager, and then only if documented in writing prior to testing.
- G. All exhaust ductwork, including toilet room exhausts, shall be constructed as for medium pressure ducts and shall be tested for leaks in the same manner as for medium pressure supply ducts.

- H. Contractor may use DUCTMATE or Ward flanged Duct Joint system, reference SMCNA FIG. 1-4 "Transverse Joints" T-25a or T-25b on rectangular ductwork. Slip-on duct flanges are not acceptable. Contractor may at his option (where space permits) use rectangular ductwork with DUCTMATE or Ward system in lieu of oval ductwork.
- I. Rectangular 90 degree elbows shall be constructed with single thickness turning vanes mounted on an integral rail. Mitered 90 degree elbows are not allowed unless approved by the Engineer and Construction Manager. Radius type rectangular elbows shall have a centerline radius of 1-1/2 times the duct diameter or width. . Elbows in round or oval ducts may be smooth long radius as described above or 5-piece 90 degree elbows and 3-piece 45 degree elbows. Joints in round ducts shall be slip type with a minimum of three sheet metal screws. Joints in sectional elbows shall be sealed as specified for duct sealing.

2.4 MIXED AND R. A. (LOW PRESSURE) CASING PLENUMS:

- A. All low pressure casings and plenums shall be following gauges and construction:

Casing Height	Galv	Alum.	Angles	Standing Seams
Up to 4'	20 ga.	.051	1 x 1 x 1/8"	1"
4' to 6'	18 ga.	.051	1 x 1 x 1/8"	1"
6' to 8'	18 ga.	.064	1-1/2 x 1-1/2 x 3/16"	1-1/2"
8' to 10'	18 ga.	.064	1-1/2 x 1-1/2 x 3/16"	1-1/2"
Over 10'	16 ga.	.064	2 x 2 x 3/16"	1-1/2"

- B. All low pressure casings shall be fabricated by the Mechanical Contractor enclosing the filter and automatic dampers as shown on the Drawings. The casing shall be fabricated of galvanized sheet metal erected with 3 foot center maximum standing seams reinforced with 1/4 inch bars. The casing shall be stiffened on three foot centers maximum with angle irons tack welded in place.
- C. All openings to the casing shall be properly sealed to prevent any air leakage. Access doors shall be installed as shown and shall be air tight, double skin insulated construction with frames welded in place. Doors shall be rubber gasketed with #390 Ventlok gasketing and equipped with fasteners equal to Ventlok #310 latches and #370 hinges that can be operated from both the inside and the outside.
- D. Casings shall be anchored by the use of angle irons sealed and bolted to the curb and floor of the apparatus casing. Submit Shop Drawings for approval. The casing shall be tested and provided tight at a pressure of three inches water column.
- E. The casing shall have 1" thick duct liner applied as specified under paragraph "Duct Liner" in this section.

2.5 MEDIUM PRESSURE BUILT-UP UNIT CASINGS:

- A. All medium pressure unit casings shall be fabricated by the Mechanical Contractor and shall enclose the filters and automatic dampers. Casings shall be constructed of cellular, standing seam panels with 3" deep reinforced "hat" sections as manufactured by metal deck manufacturers and as shown and described in SMACNA High Velocity Duct Standards Manual. Shop Drawings shall be submitted for approval showing casing construction details and equipment layout and mounting. Shop fabricated cellular sections are acceptable under the foregoing conditions if evidence is provided to show ability of cellular section to withstand the static pressures of the system.
- B. All openings to the casing shall be properly sealed to prevent any air leakage. Access doors shall be installed for easy access to equipment and shall be air tight, double skin insulated construction with frames welded in place. Doors shall be rubber gasketed with #390 Ventlok gasketing and equipped with fasteners equal to Ventlok #310 latches that can be operated from both the inside and the outside. Hinges shall be equal to Ventlok #370.

- C. Casing shall be anchored by the use of galvanized angle irons sealed and bolted to the curb and floor of the apparatus casing as shown on the SMACNA Drawings.
- D. A fan discharge diffuser plate shall be located on the fan discharge and shall be constructed of 10 gauge steel perforated plate installed in 6" channel iron frames (8.2#) rigidly supported to withstand the high velocity discharge of the fan. Perforations shall be 3/8" (.375") staggered on 11/16" centers (27% open area). One section shall be hinged to provide an access door between the discharge side of the fan and the entering side of the coils. After fabrication of diffuser plate, coat it with rust resistant paint. After installation, touch-up diffuser plate and paint channel iron frames with rust resistant paint.
- E. Casing shall have sufficient access openings to allow access for maintenance of all parts of the apparatus. Access door size shall be as large as feasible for the duty required.

2.6 ELBOWS:

- A. Where rectangular elbows are shown, or are required for good air flow, contractor shall provide and install turning vanes. Turning vanes shall be factory fabricated with integral support rail. Radius elbows shall have a centerline radius of not less than one and one-half (1-1/2) times the duct width. Submit Shop Drawings on factory fabricated and job fabricated turning vanes. Provide turning vanes in all rectangular radius elbows and offsets.
- B. All turning vanes shall be anchored to the cheeks of the elbow in such a way that the cheeks will not breathe at the surfaces where the vanes touch the cheeks.

2.7 ALUMINUM DUCTWORK:

- A. Provide aluminum ductwork only where indicated on the drawings.
- B. Duct joints shall be all soldered construction, one standard gauge heavier than for the same size galvanized steel ducts.

2.8 LINT COLLECTOR SYSTEMS:

- A. Duct system shall be galvanized, constructed and supported in accordance with SMACNA Industrial Round Duct Construction for Class 2, 8" w.g. pressure.

2.9 DRYER EXHAUST DUCTWORK

- A. Construct dryer exhaust ductwork in accordance with the International Mechanical Code. Provide sheet metal ductwork fabricated of size as recommended by dryer manufacturer, or as shown on plans. Provide cleanouts in ductwork at all changes of directions.
- B. Provide cleanable lint trap as recommended by the dryer manufacturer in the ductwork that is accessible by dryer user.
- C. Do not install any screws or other items that may protrude in the ductwork. Joints shall be installed so that male end of slip-fit ductwork shall extend in direction of airflow.
- D. Terminate ductwork with rain cap or side wall louver as recommended by dryer manufacturer. Insulate exterior of ductwork with 1-inch insulation to minimize condensation in ductwork.
- E. Do not test Double Wall Flue Piping or Dryer Exhaust Ductwork.

Dryer Exhaust Ductwork	Galvanized Steel	Low Pressure
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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer also to requirements included in Part 2 of this specification.
- B. Obtain manufacturer's inspection and acceptance of fabrication and installation of fiberglass ductwork prior to beginning of installation.
- C. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- E. Slope underground ducts to plenums or low pump out points at 1:500. Provide access doors for inspection.
- F. Coat buried, metal ductwork without factory jacket with one coat and seams and joints with additional coat of asphalt base protective coating.
- G. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- H. Connect terminal units to medium or high pressure ducts directly or with two feet maximum length of flexible duct. Do not use flexible duct to change direction. Allow for a minimum of 3 diameters of straight duct to the entrance of all terminal units.
- I. Connect diffusers with 5'-0" maximum length or troffer boots with 2' maximum length of flexible duct to low pressure ducts. Hold in place with strap or clamp, and seal as specified.
- J. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel for ductwork exposed to view and stainless steel or galvanized steel for ducts where concealed.
- K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 LOW PRESSURE DUCT SUPPORTS:

- A. See Section 23 05 29.

3.3 MEDIUM PRESSURE DUCT SUPPORTS:

- A. See Section 23 05 29.

3.4 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM	MATERIAL
Medium Pressure Supply	Galvanized Steel
Low Pressure Supply	Galvanized Steel
Return/Relief Air	Galvanized Steel
General Exhaust Air	Galvanized Steel

3.5 CLEANING OF SYSTEMS:

- A. Before turning the installation over to the Owner, all ducts should be cleaned and blown free of all dust and dirt that has collected in the ducts.

END OF SECTION 23 31 00

SECTION 23 33 00

DUCTWORK ACCESSORIES

PART 1 - GENERAL

- 1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:
- A. Section 23 00 00 – Basic Mechanical Requirements
 - B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
 - C. Section 23 05 53 – Mechanical Identification
- 1.2 WORK INCLUDED
- A. Manual and Automatic Volume Control Dampers
 - B. Fire Dampers
 - C. Combination Fire/Smoke Dampers
 - D. Backdraft Dampers
 - E. Air Turning Devices
 - F. Duct Access Doors
 - G. Duct Test Openings
- 1.3 RELATED WORK
- A. Products installed, but not furnished under this section include airflow stations and automatic control dampers to be provided by Controls Contractor under section 23 29 23.
 - B. Section 23 05 48 - Vibration Isolation
 - C. Section 23 31 00 - Ductwork
 - D. Section 23 36 00 - Air Terminal Units: Medium and High Pressure Damper Assemblies
- 1.4 REFERENCES
- A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
 - B. SMACNA - Low Pressure Duct Construction Standards
 - C. UL 33 - Heat Responsive Links for Fire Protection Service
 - D. UL 555 - Fire Dampers and Ceiling Dampers
- 1.5 SUBMITTALS
- A. Submit shop drawings and product data under provisions of Section 23 00 00.

- B. Provide shop drawings for shop fabricated assemblies indicated, including manual volume dampers, automatic control dampers, duct access doors, and duct test holes. Provide product data for hardware used.
- C. Submit manufacturer's installation instructions under provisions of Section 23 00 00 for fire dampers and combination fire and smoke dampers.

PART 2 - PRODUCTS

2.1 DAMPERS

- A. Furnish and install manual volume dampers where shown on the drawings and wherever necessary for complete control of the air flow, including all supply, return and exhaust branches, "division" in main supply, return and exhaust ducts, each individual air supply outlet and fresh air ducts. Where access to dampers through a fixed suspended ceiling is necessary, the Contractor shall be responsible for the proper location of the access doors.
- B. Dampers shall be carefully fitted, and shall be controlled by locking quadrants equal to Ventlok No. 555 on exposed uninsulated ductwork, No. 644 on exposed externally insulated ductwork and No. 677 (2 5/8" diameter) chromium plated cover plate for concealed ductwork not above lay in accessible ceilings. Furnish and install end bearings for the damper rods on the end opposite the quadrant when No. 555 or No. 644 regulators are used, and on both ends when No. 677 regulators are used.
- C. On concealed ductwork above lay in accessible ceilings use Ventlok No. 555 or No. 644 locking quadrant for splitter dampers.
- D. Dampers larger than three (3) square feet in area shall be controlled by means of rods hinged near the leading edge of the damper with provisions for firmly anchoring the rod and with end bearings supporting the axle.
- E. Manual volume dampers shall be equal to Ruskin model CD60, Greenheck model VCD-33, or approved equal. Blades shall not exceed 48 inches (48") in length or twelve inches (12") in width and shall be of the opposed interlocking type. The blades shall be of not less than No. 16-gauge galvanized steel supported on one-half inch (1/2") diameter rust proofed axles. Axle bearings shall be the self lubricating ferrule type.
- F. Install all automatic control dampers, furnished by the Temperature Control Manufacturer, in strict accordance with the manufacturer's recommendations and requirements of these Specifications.

All adjustable dampers installed in externally insulated ductwork shall be installed with Ventlok No. 639, or equal, elevated dial operators. Insulation shall extend under the elevated dial. All adjustable dampers installed in internally insulated ductwork shall be installed with Ventlok No. 635, or equal, dial operators. All damper shaft penetrations in the ductwork shall be installed with Ventlok #609 end bearings.

2.2 FIRE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS

- A. Fire Dampers
 - 1. Furnish and install where shown on the drawings or required by the Specifications, fire dampers meeting the following requirements.

2. Each fire damper shall be constructed and tested in accordance with Underwriters Laboratories Safety Standard 555. All dampers shall possess a 1 1/2 hour or 3 hour (as appropriate for the construction shown in the architectural drawings) protection rating, 165 or 212 degree F fusible link, and shall bear a U.L. label in accordance with Underwriters Laboratories labeling procedures. Fire dampers shall be constructed such that the damper frame material and the curtain material shall be galvanized.
 3. Fire dampers shall be curtain blade or multi-blade type and the damper shall be so constructed that the blades are either out of the air stream or installed in an oversized sleeve to provide a 100 percent free area of the duct in which the damper is housed.
 4. The damper manufacturer's literature submitted for approval prior to the installation shall include performance data developed from testing in accordance with AMCA 500 Standards and shall show the pressure drops for all sizes of dampers required at anticipated airflow rates. Maximum pressure drop through fire damper shall not exceed 0.05 inch water gauge.
 5. Fire dampers shall be equipped for vertical or horizontal installation as required by the locations shown in the drawings. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles and other material and practices required to provide an installation equivalent to that utilized by the manufacturer when the respective dampers were tested by Underwriters Laboratories. Mounting angles shall be a minimum of 1 1/2 inch by 1 1/2 inch by 14-gauge and bolted, tack welded or screwed to the sleeve at maximum spacing of 12 inches and with a minimum of two connections at all sides. Mounting angles shall overlap at least equal to the gauge of the duct defined by the appropriate SMACNA Duct Construction Standard, latest edition, and as described in NFPA 90A. The entire assembly, following installation, shall be capable of withstanding 6" water gauge static pressure.
 6. The damper installation shall be in accordance with the damper manufacturer's instructions.
 7. All fire dampers shall comply with the specification as written above and shall be Ruskin model DIBD2 (Style C, CR or CO), Greenheck model DFD 150 or DFDR-150 (Type C, CR or CO), or Pottorff model VFD-10D-A.
 8. The contractor shall completely seal the assembly to the building components using Hardcast 1602 sealant tape to allow for expansion and contraction of the sleeve and damper assembly.
 9. Dampers shall be UL labeled for use in dynamic systems. Closure reading shall be 110% of the maximum design airflow at the point of installation. The minimum closure pressure rating shall be 8" wg for airflow in either direction.
- B. Combination Fire/Smoke Dampers
1. Furnish and install where shown on the drawings, or as required by the specifications, combination fire/smoke dampers meeting the following requirements.

2. Each combination fire/smoke damper shall be 1 1/2 hour fire rated under UL Standard 555, 4th Edition, and shall be further classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to it. The damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be no higher than Leakage Class I (4 cfm per square foot at one inch water gauge pressure and 8 cfm per square foot at 4 inches water gauge pressure). The maximum air pressure drop through each combination fire/smoke damper shall not exceed 0.10 inch water gauge at the design air quantity. (Note that this may require a larger damper than the connected duct size.)
3. The damper frame shall be a minimum of 20-gauge galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze Oilite sleeve type turning in an extruded hole in the frame or an extruded frame raceway. The dampers may be either parallel or opposed blade type. The blades shall be constructed with a minimum of 14-gauge equivalent thickness. The blade edge seal material shall be able to withstand 450 degrees F. The jamb seals shall be flexible stainless steel compression type or lap seal type.
4. In addition to the leakage ratings specified herein, the combination fire/smoke dampers and their operators shall be qualified under UL555S to an elevated temperature of 250 degrees F. Electric operators shall be installed by the damper manufacturer at the time of damper fabrication. The damper and operator shall be supplied as a single entity that meets all applicable UL555 and UL555S qualifications for both dampers and operators. The manufacturer shall provide a factory-assembled sleeve. The sleeve shall be a minimum of either 20-gauge for dampers where neither width nor height exceeds 48 inches or 16-gauge where either dimension equals or exceeds 48 inches.
5. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4 inches water gauge in the closed position, and 2500 fpm air velocity in the open position.
6. Each combination fire/smoke damper shall be equipped with a UL Classified Firestat/releasing device. The Firestat/releasing device shall electrically and mechanically lock the damper in a closed position when the duct temperatures exceed 165 degrees F and still allow the appropriate authority to operate the damper as may be required for smoke control functions. The damper must be operable while the temperature is above 250 degrees F. The actuator/operator package shall include two damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One switch shall close when the damper is fully open, and the other switch shall close when the damper is fully closed. The Firestat/releasing device and position indicator switches shall be capable of interfacing electrically with the smoke detectors, building fire alarm systems, and remote indicating/control stations.
7. The damper releasing device shall be mounted within the airstream. The device shall be activated and the damper shall close and lock when subjected to duct temperatures in excess of approximately 285 degrees F.

8. Motors for operation of smoke dampers shall be smoke system fail safe, spring return normally open supplies and normally closed returns, or as indicated in the plans, and shall be furnished and installed by the damper manufacturer as required by the U.L. rating mentioned above. Motors shall be electric or pneumatic to match the type of temperature control system specified elsewhere in this specification. All required relays, EP switches, wiring piping and other labor and material necessary to completely interconnect the smoke detector system shall be furnished by the Contractor.
9. Each damper shall be furnished in a square or rectangular configuration. The Contractor shall furnish and install sleeves manufactured by the approved damper manufacturer for each damper. The sleeves shall be constructed with square or rectangular to square, rectangular, round, or oval adapters as required. Dampers shall be installed in the sleeves in accordance with manufacturers U.L. installation instructions. The entire assembly, following installation, shall be capable of withstanding 6" W.G. static pressure.
10. All combination fire/smoke dampers shall comply with the specification as written above and shall be Ruskin Model FSD60, Greenheck Model FSD 331, or Pottorff.
11. The contractor shall completely seal the assembly to the building components using Hardcast 1602 sealant tape to allow for expansion and contraction of the sleeve and damper assembly.
12. Dampers shall be UL labeled for use in dynamic systems. Closure reading shall be 110% of the maximum design airflow at the point of installation. The minimum closure pressure rating shall be 8" wg for airflow in either direction.

C. Submittal and Installation

1. The air quantity and free area through each fire and combination fire and smoke damper has been noted on the drawing adjacent to the duct size or wall opening size where such damper is required.
2. Submittal(s) for fire, smoke, and combination fire/smoke dampers shall include the following:
 - a. Assign identification numbers for each damper with corresponding number noted on the drawings.
 - b. Provide air quantity, size, free area of damper, pressure drop and proposed velocity through each damper.
 - c. Provide manufacturer's data of damper and its accessories or options.
3. One sample 18" x 12" damper shall be furnished for the purpose of illustrating damper operation to the Owner's operating and maintenance personnel.
4. Access doors as specified elsewhere shall be provided to make all parts of the damper accessible. Doors shall open not less than 90 degrees following installation and shall be insulated type where installed in insulated ducts.
5. Contractor shall install each damper square and true to the building. The installation shall not place pressure on the damper frame, but shall enclose the damper as required by UL555.

6. After each fire damper and combination fire and smoke damper has been installed and sealed in their prescribed openings and prior to the installation of the ceilings, the Contractor shall, as directed by the Construction Inspector, activate part or all the dampers as required to verify "first time" closure. Activation of the damper shall be accomplished by manually operating the resettable link, disconnecting the linkage at the fusible link of the fire damper, and manually operating the fire/smoke damper through the pneumatic or electronic controls as appropriate. Failure of the damper to close properly and smoothly on the first attempt will be cause to replace the entire damper assembly.

2.3 SCREENS

- A. Furnish and install screens on all duct, fan, etc., openings furnished by this Contractor that lead to, or are, outdoors. Screens shall be No. 16-gauge, one half inch (1/2") mesh in removable galvanized steel frame. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

2.4 TEST OPENINGS

- A. Furnish and install in the return air duct and in the discharge duct of each fan unit Ventlok No. 699 instrument test holes. The test holes shall be installed in locations as required to measure pressure drops across each item in the system, e.g., O.A. louvers, filters, fans, coils, intermediate points in duct runs, etc.

2.5 DUCT TAPS (CONICAL FITTINGS)

- A. Conical fittings shall be used for duct taps and shall include quadrant dampers on all lines to air devices (diffusers and grilles), even though a volume damper is specified for the air device. A damper is not required for medium pressure duct taps. Spin in fittings shall be sealed at the duct tap with a gasket, or compression fit, or sealed with sealant specified for medium pressure ductwork. The location of spin in fittings in the ducts shall be determined after dual or single duct terminal units are hung or the location of the light fixtures is known to minimize flexible duct lengths and sharp bends.
- B. The conical fitting shall be made of at least 26-gauge galvanized sheet metal. The construction to be a two-piece fitting with a minimum overall length of 6 inches and shall be factory sealed for high pressure requirements. Average loss coefficient for sizes 6, 8, and 10 shall be less than 0.055.
- C. Each fitting shall be provided with a minimum 24-gauge damper plate with locking quadrant operator and sealed end bearings. Damper blade shall be securely attached to shaft to prevent damper from rotating around shaft.
- D. Provide flange and gasket with adhesive peel-back paper for ease of application. The fitting shall be further secured by sheet metal screws spaced evenly at no more than 4 inches on-center with a minimum of four screws per fitting.
- E. The conical bellmouth fitting shall be Series 3000G as manufactured by Flexmaster U.S.A., Inc., or Buckley Air Products, Inc., 'AIR-TITE'.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions.

- B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
- C. Provide balancing dampers on medium or high pressure systems where indicated.
- D. Provide fire dampers, and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Demonstrate re setting of fire dampers to Owner's representative.
- F. Provide backdraft dampers on exhaust fans or exhaust ducts where indicated.
- G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.
- H. Provide duct access doors for inspection and cleaning before and after duct mounted filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated.
- I. Provide duct test holes where indicated and where required for testing and balancing purposes.

END OF SECTION 23 33 00

SECTION 23 34 16

FANS

PART 1 - GENERAL

1.1 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

- A. Section 23 00 00 – Basic Mechanical Requirements
- B. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors
- C. Section 23 05 53 – Mechanical Identification

1.2 SECTION INCLUDES

- A. Roof Mounted Exhaust Fans
- B. Inline Centrifugal Fans
- C. Sidewall Propeller Fans
- D. Utility/Vent Sets
- E. Housed Centrifugal Fans
- F. Plenum Fans
- G. Drives
- H. Fan Accessories

1.3 RELATED WORK

- A. Section 23 05 13 - Motors
- B. Section 23 05 48 - Vibration Isolation
- C. Section 23 07 13 - Ductwork Insulation
- D. Section 23 29 23 – Variable Speed Drives
- E. Section 23 31 00 - Ductwork
- F. Section 23 33 00 - Ductwork Accessories: Backdraft Dampers
- G. Section 26 05 19 - Cable, Wire and Connectors, 600 Volt
- H. Section 26 27 26 - Wiring Devices and Floor Boxes

1.4 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings

- C. AMCA 99 - Standards Handbook
- D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
- E. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data
- F. NEMA MG1 - Motors and Generators
- G. NFPA 70 - National Electrical Code
- H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

1.5 SUBMITTALS

- A. Submit under provisions of Section 23 00 00.
- B. Shop Drawings: Indicate assembly of fans and accessories including dimensions, installation and mounting details, weights, service clearances, connection locations and types, and electrical connection requirements.
- C. Product Data: Submittal data for approval for all fans of every description furnished under this section of these Specifications shall include the following:
 - 1. Manufacturers software selection output that includes:
 - a. fan curve with specified operating point clearly plotted Brake horsepower, motor horsepower and fan static efficiency
 - b. System effect allowance (where applicable)
 - c. Fan and motor RPM
 - d. Clearly plotted "do not select left of this curve"
 - 2. For fans above 10 horsepower, provide selections for the same fan (motor may vary) at TSP equal to scheduled TSP plus 0.5" wg.
 - 3. Sound power levels for both fan inlet and outlet at rated capacity. Include breakout sound power levels for cabinet mounted fans.
 - 4. Materials of construction
 - 5. Electrical characteristics and connection requirements.
 - 6. All data on fan accessories.
- D. Manufacturer's Installation Instructions.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 23 00 00.
- B. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.

- B. Protect motors, shafts, and bearings from weather and construction dust.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

1.9 EXTRA MATERIALS

- A. Furnish under provisions of Section 23 00 00.
- B. Provide two sets of belts for each belt drive fan, not including the set installed on the fans. Tag sets to identify fan.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. Performance Base: Sea level conditions.
- E. Temperature Limit: Maximum 300 degrees F.
- F. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.
- G. Selection Restrictions:
 - 1. Direct drive fans may not be selected to operate at higher RPM than the driving motor nominal RPM rating.
 - 2. Fans furnished with VFDs may not be selected to operate with an input frequency greater than 60 hz.
 - 3. Fans may not be selected to operate in the service factor of the motor.
 - 4. Fans may not be selected to operate in an unstable region of the fan curve ("left of the do not select" curve)
 - 5. Fans may not be selected with a brake horsepower greater than 5% of the scheduled brake horsepower
 - 6. Scheduled fan static pressure is external to the specified product. Fans that include integral backdraft dampers, plenums, energy recovery coils, attenuators, etc must add the pressure drop associated with those accessories to the scheduled static pressure to obtain the total static pressure for fan selection.

2.2 EXHAUST FANS:

- A. Belted vent set exhaust fans shall be Cook, Greenheck, Twin Cities, or approved equal. The fans shall be complete with belt guards, heavy-duty gravity shutters, drain holes in scroll, flanged inlet and outlet connections, etc. Motor mounts shall be adjustable for proper alignment and

adjustment of belts. Furnish with a factory applied prime coat of paint. Fans shall be AMCA rated.

- B. Centrifugal exhaust fans shall be Cook, Greenheck, Twin Cities, or approved equal, single inlet, single width belted vent fans conforming to the following requirements.
 - 1. Fans, as shown on the Drawings and having the capacities, characteristics and starting equipment shown in the schedule, shall be belt driven (as scheduled) and of the centrifugal type, especially selected for ventilating work. The fans shall run in perfect balance at all speeds, up to a 15% increase above the speeds indicated in the schedule, without noise or excessive vibration in fan or motor. Fan wheels shall be made with backward pitched blades. Blades shall be die-formed, true in shape and held in place by rivets or weld.
 - 2. Fans shall be provided with antifriction bearing of the types specified herein. Shafts shall be made of the best quality steel, turned and ground to close tolerance and shall run true and in perfect balance.
 - 3. Fans shall be arranged for multiple V-belt drives and shall be furnished complete with Vari-Pitch sheaves for single or two belt drives and fixed sheaves for three or more belt drives. Provide a second fixed sheave for final balancing of size as determined after job operating conditions are known.
- C. Inline exhaust fans shall be Cook, Greenheck, or Twin Cities, in-line centrifugal or vane axial as approved. Capacity ratings shall be based upon tests performed in accordance with AMCA Standard 210. Each fan shall carry near the unit nameplate the AMCA seal indicating that capacity ratings are certified. Housings for all inline fans shall be of 14-gauge steel minimum and shall have square mounting frame of heavy steel angle to provide for mounting of fan. The fan housing will provide for slip joint duct connection. Fan wheels shall be axial flow type with cast aluminum blades or tubular centrifugal type constructed of welded steel and have airfoil shaped blades. The fan shall be dynamically balanced for smooth operation. The fan shaft shall be solid be solid steel AISI-C1040 keyed to the fan wheel. Grease lubricated bearings shall be selected for a minimum average life in excess of B-10, minimum life 40,000 hours at maximum catalogued operating conditions. Fans shall be provided with factory mounted inlet and outlet sound attenuators when required to meet the scheduled sound power levels. .
- D. Propeller or centrifugal roof exhaust air fans shall be Cook, Greenheck, Twin Cities, or approved equal. The fans shall be complete with fans and motors, propeller, motorized dampers factory wired to open when fans are in operation and close when fans are not in operation, bird screens, and round spun aluminum weatherproof protection covers. Fans shall be all aluminum. The fans shall be firmly bolted to the curb on which they rest. Fans shall be AMCA rated. Wing nuts of nonferrous construction shall be provided to remove covers.
- E. Propeller wall fans shall be Cook, Greenheck, Twin Cities, or approved equal, belt or direct driven as scheduled on the Drawings. The fans shall be complete with guards over motor side, heavy-duty gravity shutters, etc. Furnish with a factory applied prime coat of paint. Fans shall be AMCA

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible connections specified in Section 23 33 00 between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one-inch flex between ductwork and fan while running.

- C. Provide fixed sheaves required for final air balance.
- D. Provide safety screen or cage where inlet or outlet is exposed. Plug fans inside walk-in casings shall be provided with hinged safety cage.
- E. Pipe scroll drains over to nearest floor or roof drain.
- F. Provide motorized dampers on discharge of exhaust fans where indicated. Refer to Section 23 33 00.
- G. Unless specified elsewhere, the fan manufacturer shall dynamically balance the fan with the fan set in place, leveled, and ductwork attached, to a vibration velocity less than or equal to 0.200 inches (0.100 inches for direct-drive applications) per second measured on horizontal, vertical, and axial planes at each bearing pad. Vibration amplitudes are in inches/second peak velocity. All values recorded are to be filter-in at the fan speed. Confirm the fan/motor vibration velocity limit over the following operating speed range: Fans with VFDs shall be checked from 15 to 110% of rated fan speed. Constant speed fans shall be checked at 100% of rated fan speed. 'Lock-out' ranges may be used to correct up to two ranges of excess vibration. The span of each 'lock-out' range shall be limited to an effective fan speed of 50 RPM. Any 'lock-out' range used shall be clearly identified in the test report and shall be prominently displayed on a typed, laminated legend mounted inside the VFD controller cabinet. This testing shall be witnessed by a representative of the Owner's Test and Balance Consultant.
- H. Failure to confirm vibration velocity limit shall require re-balancing and re-testing until criteria is met. Contractor shall bear all costs involved in the modifications, balancing, and re-testing, including travel and hourly costs associated with the Owner's Test and Balance firm's consultant.

END OF SECTION 23 34 16

SECTION 23 37 00 AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. SUMMARY
- C. Perform all Work required to provide and install diffusers, diffuser boots, registers/grilles, louvers, louver penthouses, roof hoods, and goosenecks indicated by the Contract Documents with supplementary items necessary for proper installation.

1.02 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
 - 2. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
 - 3. AHRI 890 – Rating of Air Diffusers and Air Diffuser Assemblies.
 - 4. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
 - 5. SMACNA 1035 - HVAC Duct Construction Standards - Metal and Flexible.

1.03 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit product data and Shop Drawings, indicating type, size, location, application, material, finish, and type of mounting. Submit performance data including throw and drop, static pressure drop and noise ratings.
 - 2. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

- B. Operation and Maintenance Data:
 - 1. Submit manufacturer's installation instructions under provisions of Division 01.
- C. Samples: At the request of the Owner and/or A/E team, submit each exposed product for each color and texture specified.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Grilles, registers and diffusers shall be as scheduled on the Drawings. Grilles, registers and diffusers shall be provided with sponge rubber or soft felt gaskets where noted on the Drawings. Grilles, slot diffusers and laminar flow bars shall not be internally insulated. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level, face velocity, throw, pressure drop, etc., before the submittal is made. Selections shall meet the manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the five (5) foot occupancy zone will not exceed 50 fpm nor be less than 25 fpm except where indicated otherwise. Select grilles, registers, and diffusers with a noise criteria (NC) rating that is 10 points below the NC levels published in ASHRAE for the type of space being served. In the vicinity of lab hoods, terminal velocity at face of hood shall not exceed 20 fpm.
- C. Locations of air distribution devices on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be influenced by the established general pattern of the lighting fixtures or architectural reflected ceiling plan, but primarily located to maintain proper air distribution. Where called for on Drawings, grilles, registers and diffusers shall be provided with deflecting devices and manual dampers. These grilles, registers, and diffusers shall be the standard product of the manufacturer, and subject to review by the Architect.
- D. Provide a frame compatible with the type of ceiling or wall in which the devices are installed. Refer to Architectural Drawings for exact type of ceiling specified.
- E. Coordinate color and finish of the devices with the Architect.

2.02 MANUFACTURERS

- A. Grilles, Registers, and Diffusers:
 - 1. Titus Products.
 - 2. Price Industries.
 - 3. Nailor Industries.
- B. Roof Hoods:
 - 1. Greenheck.

2. Cook.

2.03 RECTANGULAR CEILING DIFFUSERS

- A. Rectangular, full louvered face, directional, removable multi-core type diffuser to discharge air in 360-degree pattern. Neck size shall be as scheduled on the Drawings. Provide filler panels, where required, for directional throw diffusers.
- B. Fabricate frame and blades of extruded aluminum with factory baked enamel, off-white finish.
- C. Provide multi-louvered equalizing grid where noted on Drawings
- D. Provide round neck connection as scheduled on Drawings.

2.04 PERFORATED FACE CEILING DIFFUSERS

- A. Perforated face with fully adjustable pattern and removable face.
- B. Fabricate of aluminum with factory baked enamel, off-white finish.
- C. Provide multi-louvered equalizing grid where noted on Drawings.
- D. Provide round neck connection as scheduled on Drawings.

2.05 SQUARE PANEL FACE SUPPLY AND RETURN AIR CEILING DIFFUSER

- A. Architectural diffuser with a square panel centered within a square housing similar to the Titus OMNI model. Drawings that depict two-way and three-way throw options are achieved with the use of filler panel (where required) for directional throw diffusers.
- B. Opposed blade volume dampers shall be provided with the diffuser, if scheduled on the Drawings. The volume damper design shall be similar to the Titus AG-75.
- C. Although the manufacturers show this model being used only as a supply air device, this same diffuser can also be used as a return air device. The neck connection shall be the largest available neck size provided by the manufacturer.
- D. Provide round neck connection as scheduled on Drawings.

2.06 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Streamlined blades, depth of which exceeds 3/4-inch spacing, with spring or other device to set blades, vertical face.
- B. Fabricate 1-inch margin frame with concealed mounting.
- C. Fabricate of [aluminum extrusions, with factory baked enamel finish. Include mounting gasket.
- D. Opposed blade damper with removable key operator, operable from face shall only be provided with the grille when it is scheduled on the Drawing.

2.07 PLENUM SLOT SUPPLY AND RETURN DIFFUSERS

- A. Supply or return plenum slot, 3/4-inch, with single extruded aluminum curved deflector blade to create a tight horizontal airflow pattern across the ceiling. Provide slot width, length, and number of slots as scheduled on the Drawings.
- B. Diffusers shall discharge air horizontally through two outside sections and vertically through a center down-blow section.
- C. Standard nominal lengths shall be 2, 3, 4, or 5 feet. Units shall be constructed of 24 gage steel. Maximum height of the unit's plenum shall be 7-inches. Inlets shall have a minimum of 1-1/2-inch depth for duct connection. The standard finish shall be black on the face of the diffuser and pattern deflectors.
- D. Diffuser shall be similar to Titus N-1-R diffuser.

2.08 WALL SUPPLY REGISTERS/GRILLES

- A. Use double-deflection supply grilles made of aluminum.
- B. Install vertical face blades and horizontal rear blades. Provide solid, extruded aluminum blades which are individually adjustable. Space at not more than 3/4 inch centers for rear blades and 1/2 inch centers for face blades and not less than 5/8 inch deep.
- C. Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.
- D. Provide white finish on all grilles unless indicated otherwise on drawings.
- E. Provide integral [aluminum] opposed blade damper with mill finish.

2.09 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. For wall return and exhaust, provide a 45 degree fixed-blade aluminum grille. Provide 3/4 inch blade spacing as scheduled, with front blades parallel to long dimension. Provide solid, extruded frames and aluminum blades which are individually adjustable on sizes larger than 24 inches x 24 inches, roll-formed aluminum blades for smaller grilles. Include mounting gaskets. Provide white finish unless noted otherwise on drawings.
- B. Provide aluminum opposed blade damper with mill finish for all air devices used for exhaust.

2.10 WALL EXHAUST AND RETURN REGISTERS/GRILLES – SEVERE DUTY

- A. Streamlined 45-degree fixed blades, at 1/2-inch spacing, with horizontal front blades.
- B. Fabricate 1-1/4-inch margin frame with vandal-proof screws.
- C. Fabricate totally of steel with minimum 18 gage frames and minimum 14 gage blades with factory baked enamel finish.

2.11 DOOR GRILLES

- A. V-shaped louvers of 20 gage steel, 1-inch deep on 1/2-inch centers.

- B. Provide 20 gage steel frame with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.
- C. ROOF HOODS
- D. Shall be constructed of heavy gauge aluminum, with precision formed, arched panels with interlocking seams. The hood shall be bolted to a minimum 8 gauge aluminum or 12 gauge galvanized steel support structure. A radius throat must be provided for optimum performance. Lifting lugs shall be provided to help prevent damage from improper lifting. The base shall have continuously welded curb cap corners for maximum leak protection. Provide four tie-down points on relief hoods.
- E. Provide aluminum bird screen and factory finish.
- F. Roof curb shall be coordinated with roofing Contractor.

2.12 GOOSENECKS

- A. Fabricate in accordance with SMACNA 1035, 1-inch classification, of minimum 18 gage galvanized steel.
- B. Roof curb shall be coordinated with Owner and roofing Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement.
- D. Install air outlets and inlets to ductwork with airtight connection.
- E. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. The use of extractors or scoops at duct take-off to diffusers, grilles and registers is not allowed.
- F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09.
- G. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.
- H. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 00

SECTION 23 62 13 - AIR-COOLED SPLIT SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 23 01 00, "Mechanical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide split system air-conditioning unit work including, but not limited to, the furnishing and installation of:
1. DX/Electric heat air handling units with related accessories and controls.
 2. Air-cooled DX condensing units with related accessories and controls.
 3. Manufacturer's controls that provide a complete and operational system independent of any other building controls.

1.3 QUALITY ASSURANCE:

- A. Manufacturer: Provide products of one of the following:
1. Daikin
 2. Carrier Corporation
 3. Trane Company
 4. York.
- B. Certification: Provide manufacturer's certification of compliance with ARI Standard 210.

1.4 SUBMITTALS:

- A. Shop drawings submittals shall include, but are not limited to, the following:
1. Unit cutsheets clearly showing all features, accessories, dimensions, weights and capacities.
 2. Written instructions for equipment to installation.
 3. Wiring and piping diagrams and connection locations.
 4. Refrigerant piping sizing calculations.
 5. Performance certifications and test results.
 6. Warranty information.
 7. Additional information as required in Section 23 01 00.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver DX/Electric heat air handling units, condensing units and accessories in factory-fabricated water-resistant wrapping.
- B. Handle DX/Electric heat air handling units, condensing units and accessories carefully to avoid damage to material components, enclosure and finish.
- C. Store DX/Electric heat air handling units, condensing units and accessories in a clean, dry space and protect from the weather.

PART 2 - PRODUCTS

2.1 DX/ELECTRIC HEAT AIR HANDLING UNITS:

- A. General: Provide the DX/Electric heat air handling units manufacturer's standard materials, components and accessories as indicated by product information, designed and constructed as recommended by the manufacturer and as required for a complete installation, except as otherwise indicated. Units shall be rated and tested in accordance with ARI 210, 240 and 360 and shall be UL listed and labeled in accordance with UL 465/1995.
- B. Units: Air handling units shall be completely factory assembled in an insulated vertical housing, complete with DX cooling coils, condensate drain pan, fan, fan motor, electric heater (where scheduled), filters, controls and accessories. Units shall be factory wired for a single point electrical connection.
- C. Casings: Casings shall be constructed of heavy gauge zinc-coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish. Casing shall be completely insulated with fire-retardant, permanent, odorless glass fiber material.
- D. Refrigerant Circuits: Units up to 7-1/2 tons shall have a single refrigerant circuit. Units 10 tons and larger shall have dual refrigerant circuits. Each refrigerant circuit shall be controlled by a factory installed thermal expansion valve.
- E. Evaporator Coils: Evaporator coils shall be configured aluminum fins mechanically bonded to seamless copper tubing. Coils shall be factory pressure and leak-tested to 375 psig air pressure. Coils shall be arranged for draw-thru airflow and shall be completely factory assembled, including expansion valves. Coils shall have condensate drain pans with external drain connections on each side of the unit. Dual circuited coils shall be circuited in an intertwined configuration.
- F. Cabinet Construction/Finish: Cabinet shall be constructed of galvanized steel with an acrylic high-heat baked-on enamel finish. The blower cabinet shall be internally insulated.
- G. Fan Section: Provide fan section (blower unit) as scheduled.
1. Centrifugal Fans: Provide double width, double inlet, multiblade type fans with air foil, forward curved or backward inclined blades, as scheduled. All fans shall be statically and dynamically balanced and tested after being installed on properly sized shafts. Fan shafts must not pass through their first critical speed as unit comes up to rated rpm. Fan wheels and scrolls shall be constructed of galvanized steel, all aluminum or fabricated steel protected with two coats of rust-inhibiting paint. Wheels and scrolls of fans used for outside air service shall be coated with two coats of fire resistant epoxy paint.
 2. Sheaves: Permanent fan sheaves shall be nonadjustable with removable machined bushings, machined on all contact surfaces. Sheaves with over three grooves shall be dynamically balanced and so designated on each sheave. Fan sheaves with three grooves or less shall be statically balanced and if weights are required, they shall be welded to the sheave. Sheaves shall be manufactured by Browning, Eaton Yale and Towne, Dodge Manufacturing Company or Fort Worth Steel and Machinery Company.
 - a. Air Handling Units: Provide a nonadjustable type sheave selected for the rated fan rpm as determined. Provide variable sheaves as required to determine correct fan rpm as established by tenant requirements. Furnish additional fixed sheaves as required after correct speed has been determined. All unused fixed sheaves shall become the property of the Owner.
 3. Belts: Provide "V-groove" type suitable for the service intended with the capacities specified. Belts shall be closely matched and tagged for use prior to shipment. Recheck belts for proper

match during operation and if necessary, replace with closely matched belt sets. Belts shall be Gates, Durkee-Atwood, Goodyear, Uniroyal or Browning.

- a. General: Provide belt guards for all fan drives mounted outside the unit housing. The finish of the guard shall be similar to that of the unit housing. Brace and fasten guards to prevent objectionable vibration. Provide tachometer openings at least 2" in diameter for checking fan and motor speeds. Openings shall be centered on shafts to allow checking rpm.
 4. Shafts: Provide one piece design shafts, either solid or hollow tube with solid stub. Hollow tube with solid stub shafts shall be hot-formed, stress relieved, and manufactured by Pittsburgh Tubular Shafting, Inc. Fans and shafts shall not pass through their first critical speed as the unit comes up to rated rpm.
 5. Shaft Bearings: Provide externally or internally mounted grease lubricated, self-aligning ball or roller bearings on each end of the shaft. Bearings shall have an average B-10 life as defined by AFBMA of 100,000 hours at design operating conditions. All bearings shall be the same size. Internally mounted bearings shall have grease lines extended so as to be readily accessible from the drive side of the unit. In addition, the bearing on the drive end of the shaft shall have grease line extended beyond the belt guard. All grease lines shall terminate in a zerk fitting. Bearings shall be by SKF, Sealmaster, Timken, or Fafnir.
 - H. Blower Motor/Drive: Blower motors shall be energy efficient 3 phase open drip-proof type. Refer to Section 15140 for additional requirements. Blower drive shall be a belt drive with adjustable pitch pulleys.
 - I. Blower Motor Starter: A factory wired, unit mounted NEMA type motor starter with 3 phase overloads and a control power transformer shall be provided.
 - J. Filter Rack/Filters: Provide units with a filter rack and 1" disposable filters.
 - K. Duct Connections: Unit shall be designed for outside air, return air and supply air connections as shown on the drawings.
 - L. Operating Controls: Furnish unit controls including system of automatic sequencing, safety and operating controls consisting of the following:
 1. High temperature cutoff.
 2. Differential air pressure switch to verify air flow.
 3. 115/24 volt control transformer.
 4. Programmable Space Thermostat for continuous fan operation during programmed occupied conditions.
 5. Two-stage heater capacity control (where scheduled).
 6. Firestat.
 7. Interlock unit controls with fan or air unit so that unit may not be energized with fan not in operation.
 - M. Performance/Ratings: Provide minimum performance as scheduled on drawings.
- 2.2 AIR-COOLED DX CONDENSING UNITS:
- A. General: Provide the DX condensing unit manufacturer's standard materials, components and accessories as indicated by product information, designed and constructed as recommended by the manufacturer and as required for a complete installation, except as otherwise indicated. Units shall be UL 1995 listed and rated in accordance with ARI Standard 210/240, 360 and 270.

- B. Units: Provide air cooled condensing units of the size, type, capacity and arrangement as shown and scheduled on the Drawings. Condensing units shall be assembled on a heavy-gauge integral steel mounting/lifting base. Units shall be weatherproofed and include hermetic compressor(s), condensing coils, fans and motors, controls and holding charge of refrigerant. Units shall have a control box access panel and removable end panels which allow access to all major components and controls.
- C. Unit Frame: Frame shall be a welded assembly of heavy gauge zinc-coated, galvanized steel. Drainage holes shall be provided as required. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish. Units shall have removable end panels for access to all major components and controls.
- D. Refrigeration Circuits: Units up to 7-1/2 tons shall have single compressors and a single refrigerant circuit for use with a single circuit cooling coil. Units 10 tons and larger shall have two compressors and two independent refrigerant circuits for use with a dual circuit cooling coil. Each refrigeration circuit shall have an integral subcooling circuit and a refrigerant filter/dryer.
- E. Compressors: Each compressor shall be a direct-drive hermetic type with centrifugal oil pump; two-point lubrication for each bearing and connecting rod; thermostatically controlled crankcase heater and well; high strength, ring-type suction and discharge valves; large gas passages and minimum clearance volumes; and internal spring isolation and muffling. External high and low cutout devices shall be provided. Evaporator defrost control provided in the indoor blower coil shall prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.
- F. Compressor Motors: Each compressor motor shall be suction gas-cooled and have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal temperature and current-sensitive motor overloads shall protect compressors under loss of charge and other abnormal operating conditions.
- G. Condenser Coils: Condenser coils shall be configured aluminum fins mechanically bonded to seamless copper tubing. Subcooling circuit(s) shall be provided as standard for each refrigeration circuit. Coils shall be factory pressure and leak-tested to 425 psig air pressure. Corrosion resistant metal grilles for coil protection shall be provided.
- H. Condenser Fans: Fans shall be vertical discharge, direct-drive type, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs. Motors shall have permanently lubricated ball bearings, built-in current and thermal overload protection and weathertight slingers over bearings. The fan motors shall be mounted in rubber isolators. Corrosion resistant fan grills shall be provided.
- I. Controls: Unit controls shall include a fused 24-volt control power transformer, magnetic contactors for each compressor, cooling low ambient fan switches, high pressure cut-out(s), low pressure cut-out(s) and reset relays. Unit completely factory-wired with necessary controls and terminal block for connection of field control power wiring. A solid state anti-short-cycle timer shall be available for retrofit on all units to prevent rapid on-off compressor cycling in light load conditions. A time-delay relay shall be provided in all dual compressor units to prevent both compressors from coming on line simultaneously.
- J. Refrigerant/Oil Charge: Units shall be shipped from the factory with a sufficient charge of refrigerant and oil for the complete system when used with pre-charged refrigerant lines.
- K. Refrigerant Line Connections: Connections shall be either compression or sweat type. Brass liquid and suction line service valves, gauge/charging ports and a suction and discharge pressure gauge panel shall be provided.
- L. Warranty: The manufacturers one year parts and labor and five year extended (non pro-rated) compressor warranty shall be provided.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install DX/Electric heat air handling units and condensing units in accordance with manufacturer's instructions, the NEC, and applicable local codes and ordinances. Test installed systems for compliance with these Specifications. Rework as required and as directed to ensure that specified and indicated requirements are met and that installed systems function as intended.
- B. Condensing Unit Mounting: Mount units on reinforced concrete pads. Pads shall extend to a minimum of 3-1/2" above finished grade and shall be a minimum of 6" thick. Refer to Section 15100 for additional requirements.
- C. Air Handling Unit Mounting: Hang the unit from the structure with all thread and vibration isolators or set on a concrete pad.
- D. Leveling: Install units level to operate without noticeable vibration after installation.
- E. Vibration Isolators: Air handling units shall be installed with vibration isolators and separated from ductwork with flexible duct connections.
- F. Refrigerant Piping: Install, test, evacuate and change refrigerant piping per the manufacturer's recommendations and as specified in Section 23 20 00.
- G. Drain Connections: Pipe condensate directly to a primed floor drain. Provide P-traps on air handling unit condensate drain connections with seal depths at least equal to the total static pressure of the unit as installed. P-traps shall be constructed of pipe and tees as detailed on the Drawings. Elbows shall not be used. All unused openings of tees shall be closed with removable plugs which shall serve as cleanouts.
- H. Filters: Install initial set of filters after ductwork has been blown out and prior to continuous operation of each air handling unit.
- I. Coil Pull Space: Air handling units shall be installed with adequate space to allow unit coils to be removed without demolition of building construction. Coil pull space and any required demolition of building construction shall be clearly indicated on As-built Drawings. The Contractor shall insure that all field-piping, valves, ductwork, and other obstructions are not in the way or can be easily removed with flanges to facilitate coil removal.

3.2 START-UP:

- A. Start-up, test, and adjust electric heaters in accordance with manufacturer's published start-up instructions. Adjust air diffusion louvers for proper air flow. Check and calibrate controls.
- B. Controls: Unit controls, including, but not limited to overcurrent protection, magnetic evaporator fan and heater stage contactors, control power transformers, terminal strips, relays and a single point power entry shall be factory installed and wired in the unit such that the only field wiring required is a single power connection to the unit and control wiring to the thermostat and condensing units. Evaporator defrost control shall be provided to prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

3.3 TESTING AND BALANCING:

- A. Refer to Section 23 05 093 for air handling unit testing and balancing.

3.4 IDENTIFICATION:

- A. Refer to Section 23 03 00 for applicable painting, nameplates, and labeling requirements.

END OF SECTION 23 62 13

SECTION 23 63 13

VARIABLE REFRIGERANT VOLUME DX SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of multiple evaporator-fan and variable capacity compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.2 SUBMITTALS

- A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics including:
 - 1. Piping schematics with intended piping line lengths indicated on the drawings (piping plan to be coordinated between manufacturer and contractor prior to submittal. Generic piping schematics are not acceptable). The manufacturer shall include notes on the piping schematics indicating locations where expansion loops shall be installed.
 - 2. Wiring schematics showing electrical connection requirements, and field control wiring terminations.
 - 3. Field refrigerant charge volume shall be noted along with factory charge. Note schedule limitations.
 - 4. Manufacturer's performance data shall reflect specified conditions. Nominal capacities are not acceptable. Ratings shall allow for piping lengths, scheduled ambient temperatures, etc.
- B. Operation and maintenance data.
- C. Contractor must have completed the manufacturer's installation training. The contractor shall submit a copy of the training completion certificate for the project manager and at least 2 pipe installers with this submittal.

1.3 QUALITY ASSURANCE

- A. The units shall be listed by the Electrical Laboratories (ETL) and bear the cETL label.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings." Provide certified efficiency ratings per AHRI-1230 standard. (DOE Waiver is not

acceptable) Scheduled EER and IEER ratings scheduled shall be considered minimum efficiency allowed.

- D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings." Provide certified efficiency ratings per AHRI-1230 standard. (DOE Waiver is not acceptable) Scheduled COP ratings scheduled shall be considered minimum efficiency allowed.
- E. Units shall be designed to operate with HCFC-free refrigerants.

1.4 WARRANTY

- A. All VRF equipment and controls shall be warranted by the manufacturer for a period of 5 years from the date of startup. (Startup not to exceed 6 months from delivery). The warranty shall include both parts and labor and refrigerant. The condensing units shall include an additional 5 years (total of 10 years) of parts only warranty covering the entire condensing unit.
- B. All warranty shall be executed by the manufacturer's authorized representative. Contractor warranty shall not be allowed.
- C. Copies of the warranty paperwork and startup documentation shall be submitted upon close out of the installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Daikin AC – Basis of Design
 - 2. LG

2.2 GENERAL DESCRIPTION

- A. The variable capacity, heat recovery and/or heat pump air conditioning system shall be a Variable Refrigerant Volume (heat and cool model) split system as specified. The system shall consist of multiple evaporators, branch selector boxes, manufacturer supplied refrigerant joints and headers, a two or three pipe refrigeration distribution system using PID control, and matched variable speed outdoor condensing units. The outdoor unit is a direct expansion (DX), air-cooled heat recovery/heat pump, multi-zone air-conditioning system with variable speed driven compressors using R-410A refrigerant. All zones are each capable of operating separately with individual temperature control.

- B. Where heat recovery is specified, operation of the system shall permit either individual cooling or heating of each fan coil simultaneously or all of the fan coil units associated with one branch cool/heat selector box. See drawings for Branch Selector locations and associated fan coil units.
- C. Branch selector (BS) boxes shall be located as shown on the drawing. The branch selector boxes shall have the capacity to control up to 96 MBH (cooling) down stream of the BS box. The BS box shall consist of five electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the BS box and main processor and between the BS box and fan coils. The BS box shall control the operational mode of the subordinate fan coils. The use of five EXV's ensures continuous heating during defrost, no heating impact during changeover and reduced sound levels. If solenoid valves in the selector box cause a "clicking" sound upon changeover, then the contractor shall be required to provide additional acoustic wrapping of the box until sound levels are acceptable to the owner and engineer.
- D. The indoor units shall be connected to the condensing unit utilizing manufacturer specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable. All joints shall be installed per manufacturer's instructions.
- E. Equipment capacities to meet leaving air temperatures (LAT) and Total and Sensible capacities as scheduled.

2.3 DX Piping & Specialties

- A. General: Refrigerant piping shall be fabricated of Type L hard drawn "ACR" tubing that has been cleaned and capped for refrigeration service. Fittings shall be wrought copper and shall be installed with silver solder joints. The end of all pipe and the inside of all fittings shall be carefully cleaned before joining. No acid shall be used in cleaning or as a flux in soldering joints. Bleed nitrogen through all piping while soldering.
- B. Furnish, size, install and insulate refrigerant pipe for the system as shown. Submit Shop Drawings of piping system showing all traps, pipe sizes, and accessories. Drawings to be marked "Approved", and signed by a representative of the Application Engineering Department of the condensing unit manufacturer. Pipe sizes to be as recommended by unit manufacturer. Submit line sizing calculations for review by Engineer.
- C. Provide replaceable core type liquid line filter dryer sized for system capacity at 2 psig pressure drop per ARI Standard 710, sight glass-moisture indicator, thermal expansion valve with adjustable superheat, refrigerant shutoff, relief and solenoid valves recommended by the equipment manufacturer.
- D. Install and insulate all refrigerant piping per unit manufacturers latest published recommendations. Slope all lines to facilitate oil return to compressor. Provide suction line traps per manufacturers recommendations. Refrigerant piping shall be installed as shown except that modification shall be made as recommended by the compressor manufacturer. Such modifications shall be made at no cost to the Owner.
- E. Test and dehydrate all refrigerant piping as specified hereinbelow.
 - 1. After dehydration, introduce the manufacturers recommended type and quantity of refrigerant into system through a filter/dryer.

- F. Refrigerant Piping System Testing: After completion of the refrigerant piping system and before charging, test the system with dry carbon dioxide at 250 psig for 24 hours. Test joints under pressure with soap solution. During the test, isolate expansion valves and other auxiliary devices to prevent damage due to high pressure.
1. After the initial pressure test has been completed and the system proved tight, introduce a mixture of refrigerant and dry carbon dioxide into the system at 150 psig and test all devices and fittings for leaks using a halide torch.
 2. Following the satisfactory completion of all tests, evacuate the system by means of a vacuum pump connected to the liquid line. After 20" of vacuum is obtained, close the suction and discharge valves at the compressor and continue evacuation for 24 hours. Vacuum shall be measured with a mercury column vacuum gauge.

2.4 EVAPORATOR-FAN UNIT – HORIZONTAL DUCTED

- A. Concealed Horizontal Ducted Unit Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
- B. For each fan, the horsepower of the fan shall not be greater than 1.5 times the fan brake horsepower per IECC 2015.
- C. Indoor unit shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities scheduled. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening.
- D. INDOOR UNIT:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipped with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. All refrigerant lines shall be insulated from the outdoor unit.
 4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet.
 5. The indoor units shall be equipped with a return air thermistor.
 6. The indoor unit will be powered with 208~230V/1-phase/60Hz. (single point)

7. The voltage range will be 253 volts maximum and 187 volts minimum.
8. The indoor unit condensate shall be type L copper in all areas used as return air plenums, but may be PVC when enclosed in walls. The routing shown on the drawings is a suggestion. Exact routing to the shown end termination may be altered as required by coordination.

D. UNIT CABINET:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. FAN:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The unit shall be equipped with an automatically adjusting external static pressure logic selectable during commissioning.
3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
4. The airflow rate shall be available in three settings.
5. The fan motor shall be thermally protected.
6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

F. COIL:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. ELECTRICAL:

1. A separate single point power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. FILTERS:

1. The units shall be provided with an accessory rear return filter housing (field installed). If filter return grills are indicated on the drawing then this accessory is not required.
2. Provide minimum MERV 8 filter during construction. Contractor to install clean MERV 8 filters just prior to owner acceptance.

2.5 EVAPORATOR-FAN UNIT – VERTICAL DUCTED

- A. General: Indoor unit shall be a floor mounted vertical or horizontal right air handling unit, operable with refrigerant R-410A, equipped with an electronic expansion valve and direct-drive ECM type fan with auto CFM adjustment, for installation within a conditioned space. When installed in a vertical configuration it shall have top discharge air and bottom return air. When installed in a horizontal right configuration it shall have a horizontal discharge air and horizontal return air. The unit shall have a remote mounted temperature sensor or be installed with a thermostat equipped with a thermister in the controller. Return air sensor is not adequate for this unit. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition.
- B. INDOOR UNITS – VERTICAL CABINET:
1. The indoor unit components shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, brazed connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Both refrigerant lines shall be insulated from the outdoor unit.
 4. Return air shall be through an optional field supplied filter housing or via filter return grills as detailed on the drawings. Contractor to install a minimum of MERV 8 filter during construction and replace with a clean MERV 8 filter immediately prior to owner acceptance.
 5. Condensate draining shall be made via gravity or external condensate pump.
 6. The indoor unit will require a single point 208-230V/1/60 power connection.
 7. Voltage range will be 253 Volt max and 187 volt minimum.
 8. The indoor unit condensate shall be type L copper in all areas used as return air plenums, but may be PVC when enclosed in walls. The routing shown on the drawings is a suggestion. Exact routing to the shown end termination may be altered as required by coordination.
- C. UNIT CABINET:
1. The cabinet shall be constructed with sound absorbing, foil-faced insulation to control air leakage.
 2. Select an installation location with adequate structural support, space for service access and clearance for air return and supply duct connections
- D. FAN:
1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.

2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.2 to 0.5 HP
3. The airflow rate shall be available in high setting.
4. The fan motor shall be thermally protected.

G. COIL:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
1. The coil shall be a 4-row cross fin copper evaporator coil with 15 fpi design completely factory tested.
2. The refrigerant connections shall be brazed connections and the condensate will be 3/4 inch outside diameter PVC.
3. A thermistor will be located on the liquid and gas line

H. ELECTRICAL:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet

I. CONTROL:

1. The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with the manufacturer's central controller detailed further in this specification.

2.6 WALL MOUNTED FAN COIL UNIT

- A. General: indoor unit shall be a wall mounted fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor units sound pressure shall range from 31 dB(A) to 41 dB(A) at low speed measured at 3.3 feet below and from the unit. The unit shall be provided with a condensate pump. If the pump is not mounted in the unit, it shall be provided as an in-line pump to pump up to 18" vertically.
- B. Performance: Each unit's performance is per the scheduled capacities.
- C. Indoor Unit:
1. The indoor unit shall be factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The front grille shall be easily removed for wash-

- ing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Both refrigerant lines shall be insulated from the outdoor unit.
 4. Return air shall be through a resin net mold resistant filter.
 5. The indoor units shall be equipped with a condensate pan.
 6. The indoor units shall be equipped with a return air thermistor.
 7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 8. The voltage range will be 253 volts maximum and 187 volts minimum.
 9. The indoor unit condensate shall be type L copper in all areas used as return air plenums, but may be PVC when enclosed in walls. The routing shown on the drawings is a suggestion. Exact routing to the shown end termination may be altered as required by coordination.
- D. Unit Cabinet:
1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
 2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.054 to 0.058 HP.
 3. The airflow rate shall be available in high and low settings.
 4. The fan motor shall be thermally protected.
- F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The refrigerant connections shall be flare connections and the condensate will be 11/16 inch outside diameter PVC.
 4. A thermistor will be located on the liquid and gas line.
 5. A condensate pan shall be located in the unit.
- 2.6 AIR-COOLED VARIABLE REFRIGERANT VOLUME CONDENSING UNIT
- A. Outdoor units shall be provided for either 460/3/60 or 230/3/60 as scheduled.
- B. VFD Inverter Control – Each condensing unit shall use a high efficiency, variable speed “inverter” compressor coupled with inverter fan motors for superior part load performance. Compressor capacity shall be modulated automatically to maintain constant suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads.

- C. Systems shall use a field installed 16 or 18 AWG, 2-wire, stranded, non-shielded and non-polarized daisy chain control wiring to interconnect the condensing units, branch selectors, and fan coil units.
- D. Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.
- E. Condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, and refrigerant regulator.
- F. Units shall be capable of operating down to zero degree F ambient air.
- G. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
- H. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
- I. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed milled steel panels coated with a baked enamel finish.
- J. Condenser fan shall be direct drive motors that have multiple speed operation via a DC (digitally commutating) inverter.
- K. CONDENSER COIL:
 - 1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
 - 2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
 - 3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
 - 4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
 - 5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
- L. COMPRESSOR:
 - 1. The inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evap-

- orator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G2-type" with a maximum speed of 7,980 rpm.
 3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal fer-rite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
 4. The capacity control range shall be as low as 4% to 100%.
 5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
 6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
 7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
 8. The compressor shall be spring mounted to avoid the transmission of vibration.
 9. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

2.7 BRANCH SELECTOR BOXES (HEAT RECOVERY SYSTEMS)

- A. ISOLATION VALVES - Full port, bi-directional flow isolation valves shall be installed upstream of all Branch Selector boxes. Where multi-port boxes are used, provide isolation valves both upstream and downstream of the box to facilitate isolation of individual fan coil units. Ensure Schrader fitting is positioned on the downstream side of the valve.
- B. Where heat pump systems are used, provide isolation valves at the fan coils.
- C. During simultaneous heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.
- D. CONSTRUCTION:
 1. The Branch Selector boxes shall have a galvanized sheet plate casing.
 2. Each Branch Selector shall house 5 electronic expansion valves for refrigerant control. (Multi-port boxes shall maintain independent EEV construction. Sharing of valves between zones is not allowed)
 3. Where multiple boxes are installed on the same system, the piping shall be such that isolation of one box shall not disrupt refrigerant flow to other boxes. "Pass through" of refrigerant should not be used where isolation for service will prevent usage of other zones.
 4. The cabinet shall contain a subcooling heat exchanger.

5. The unit shall have a sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
6. All pipe connections shall be brazed type.
7. Branch Selectors shall not require condensate drains.

E. ELECTRICAL:

1. The unit electrical power shall be 208-230 Volt, 1 phase, 60 Hz.
2. The control voltage between the indoor and condensing unit shall be 16 Volt DC.

2.8 CONTROLS

A. ZONE CONTROLLER – Each zone/FCU shall include a 7-Day Programmable controller with the following features:

1. Backlit LCD display. Day of the week as well as time of day configurable for 12/24 hour clock shall be displayed. Display of temperature information shall be Fahrenheit. The controller shall be able to display and adjust room temperature in one degree increments.
2. The controller shall have COOL, HEAT, FAN ONLY, DRY (dehumidification), and AUTO-CHANGE-OVER modes.
3. For AUTO change over mode, the controller shall allow independent setpoints for heating and cooling to eliminate wide swings in temperature and unnecessary change over. Independent setpoint control shall be available at both local controller and the central controller
4. Setback function shall be included with adjustable setback temperature override.
5. The programmable controller shall have the capability of individually disabling the following buttons:
 - a. Menu/OK
 - b. ON/OFF
 - c. Mode
 - d. Fan Speed
 - e. Setpoint Adjustment (Up/Down Keys) (Set point adjustment shall be in 1 deg F increments)
6. The controller shall allow for a local (controller-level) adjustable limitation of user setpoint range.
7. SCHEDULING: (Schedules shall be controlled via the BAS Interface - See control sequence.)
8. The Remote Controller shall display error codes on the screen in the event of a system error.
9. The following Fan Coil Unit sensor values shall be available at the wall mounted remote controller:
 - a. Controller thermistor temp
 - b. (Refrigerant) Liquid line temperature
 - c. (Refrigerant) Gas line temperature
10. 48 Hour battery back up of clock/date. All other settings shall be stored in non-volatile memory to ensure that settings are not lost upon power failure.

B. CENTRAL CONTROLLER

1. The building shall be installed with a web-enabled factory native central controller. The manufacturer native controller shall provide web users to manipulate the following functions:
 - a. On/Off Control
 - b. Schedule-Adjustment
 - c. Mode Selection – See control sequence for heat/cool changeover control
 - d. Setpoint Control (Independent heating and cooling setpoints available)
 - e. Operational Status and Alarm Notifications
 - f. Provide with battery backup and USB port for software updates
 - g. User and Administrator Levels with password protection.
 - h. Customize groups and zones

C. CONTROL SEQUENCE:

1. The VRF system shall be provided with required hardware and software to perform the core operational sequences detailed in this section.
2. The VRF manufacturer shall be responsible for all low voltage communication wiring between their components and central controller to facilitate these sequences. If the wiring is done by the installing mechanical contractor and/or the building automation contractor, the VRF manufacturer shall coordinate all wiring requirements.
3. The VRF central controller shall be provided onsite as a touch screen panel located in the administration office (or as directed by the client). It shall additionally be capable of being accessed on the internet via an owner provided IP address and Ethernet connection. All functions detailed below shall be available via touch screen interface and internet access.
4. Display interface: The controller shall provide a floor plan layout of the building with the fan coil icons and temperature information visible on the screen. At commissioning, the fan coil units shall have the tagging updated to provide the applicable room numbers for the as-built installation. The visual interface shall provide clear indication of what fan coil units are connected to which particular condensing unit system.
5. The controller shall combine all indoor units onto a single central controller interface. The central controller shall provide these basic functions per zone:
 - a. Alarm Identification per fan coil unit.
 - b. Min/Max set point limiting
 - 1) Heating set point and cooling set points shall be controlled individually
 - 2) Set points shall be adjustable at the zone level with adjustable limits controlled by the VRF central controller (initial programming shall limit cooling setpoint control to between 73 – 76 deg. Heating initial range to be 69 – 72 deg)

Timed override for after-hours air conditioning: During periods where the building is not in use (determined by the system schedule) the fan coil units

shall be capable of being turned on at the wall mounted controller. The VRF system shall automatically turn off after 60 minutes (adj) of operation.

- c. When the system is off according to the schedule, the VRF controller shall cycle the cooling/heating if the temperatures exceed the unoccupied threshold temperatures. (85 cooling & 60 heating)
6. Heat/Cool Automatic Changeover Sequence:
- a. The VRF manufacturer's controller shall manage the heat/cool changeover automatically. The local thermostat MODE button shall be disabled by VRF central controller.
 - b. Requirement of manual change-over of heat/cool mode is not acceptable.
 - c. Each zone/fan coil unit shall have minor set point adjustment per the zone controller detail above. The central VRF controller shall monitor each fan coil unit connected to the heat pump condensing unit and compare the current temperature to the unit's set point. The central controller shall make the heat/cool mode changes for the group of fan coils based on the weighted average of their demand.
 - 1) Example – All zones are satisfied (system idle) and the system has heating mode enabled. Any fan coil on the system that has a space temperature rise above the active set point will result in a central enabling of the cooling mode.
 - 2) Individual fan coil units (or groups) should be capable of being assigned a higher priority if directed. This would allow heating/cooling needs of these units to drive the heat/cool mode changes.

PART 3 - C

3.1 INSTALLATION

- A. Mechanical contractor must complete an accredited installation training class prior to starting the installation. The contractors PM and piping foreman must each have certification.
- B. Installation shall be per manufacturer's recommendations. Extra care shall be provided to allow for expansion and contraction of piping. Contractor shall install expansion joints on gas lines per the manufacturer's recommendations.
- C. UNDER NO CIRCUMSTANCE SHALL THE FAN COIL UNITS BE OPERATED BEFORE STARTUP OR WITHOUT SPECIFIED FILTERS IN PLACE.

3.2 FIELD QUALITY CONTROL

- A. The installing contractor shall complete the installation and complete a total system pressure test of 550 psi for 24 hours prior to startup.
- B. THE MANUFACTURER OR MANUFACTURER'S AGENT SHALL BE RESPONSIBLE FOR ALL EVACUATION AND CHARGING OF REFRIGERANT FOR EACH SYSTEM AT STARTUP. CONTRACTOR STARTUP IS NOT ALLOWED.
- C. The manufacturer's agent shall provide the following startup services:
 - 1. Evacuation of the piping system to a 400 micron vacuum (hold 3 hours)
 - 2. Proper charging of the system with R-410A (Refrigerant provided and installed by the installing contractor)
 - 3. Execution of all standard diagnostics.
 - 4. Connection to the system with the manufacturer's Service Checker software and creating an operational log of the following information for verification:
 - a. Each system operates with proper temperatures, delta T and superheat conditions in both cooling and heating modes.
 - b. Each fan coil unit is heating/cooling properly (verification that piping work has been installed properly).
 - 5. A digital copy of these operational logs shall be stored by the manufacturer's agent as well as delivered to the owner with warranty documentation.

END OF SECTION 23 63 13

SECTION 26 00 01

ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and this Section govern the work of this Division.

1.02 DESCRIPTION OF WORK:

- A. Work Included: This Work of this Division includes the furnishing of all supervision, labor, materials, supplies, equipment, fixtures, apparatus, appurtenances, transportation, storage, utilities, permits and licenses required for complete installation of complete, tested and operating electrical systems as shown on the drawings and specified or as reasonably inferred there from, in place and ready for service. All work performed under this Section shall be performed in a workmanlike manner in accordance with the Drawings and Specifications and industry standards and subject to the terms and conditions of the Contract. For purposes of these Specifications, "provide" and "furnish and install" shall be synonymous.
- B. Drawings: Refer to the Electrical Drawings for graphic representations, schedules, and notations of required electrical work.
- C. Specifications: Refer to this Division and related Divisions for the primary technical specifications of electrical work.
- D. General: Comply with the most recently revised versions of applicable laws, rules, regulations, and ordinances of federal, state, and local utilities and authorities. Where alterations to and deviations from the Contract Documents are required by said authority, report the requirements and secure approval before starting work. Obtain all applicable permits, licenses and inspections and pay all fees charged by above authorities.
- E. Precedence: Where Contract Document requirements are in excess of Code requirements and are permitted under the Code, the Contract Documents shall govern. None of the terms or provisions of the Drawings or specification shall be construed as waiving any of the rules, regulations or requirements of these authorities. In the event of conflict between the Contract Documents and the local enforcing authority, the latter shall rule. Any modifications resulting there from shall be made without additional cost to the Owner or Engineer. This Contractor shall report any such modifications to the Engineer and secure his approval before proceeding.

1.03 QUALITY ASSURANCE AND STANDARDS:

- A. Materials/Methods: Manufacturers, materials, and methods described in the various sections of the Specifications and indicated on the Drawings are intended to establish a standard of quality only. It is not the intention of the Engineer to discriminate against any product, material or method that is equal to the standards as indicated and/or specified, nor is it intended to preclude open, competitive bidding. The fact that a specific manufacturer is listed as an acceptable manufacturer should not be interpreted to mean that the manufacturers' standard product will meet the requirements of the project design, Specifications and space constraints. The Engineer shall be the sole judge of quality and equivalence of equipment, materials and methods.
- B. Alternative Products/Materials/Methods: Products by other reliable manufacturers, other materials, and other methods may be accepted provided they have equivalent capacity, construction, and performance. Under no circumstances shall any substitution be made without the prior written approval of the Engineer. Wherever a definite product, material or method is

specified and there is not a statement that another product, material or method will be acceptable, it is the intention of the Engineer that the specified product, material or method is the only one that shall be used without prior approval. Wherever a definite material or manufacturer's product is specified and the Specification states that products of similar design and equal construction from the specified list of manufacturers may be provided, it is the intention of the Engineer that products of manufacturers that are specified are the only products that will be acceptable and that products of other manufacturers will not be considered for substitution without prior written approval.

- C. Alternative Equipment: Where substituted or alternative equipment is used on the project, it shall be the responsibility of the Contractor or Subcontractor involved to verify that the equipment will fit in the space available, including all required Code and maintenance clearances, and to coordinate all equipment requirements and provisions with the Electrical Design and all other Contractors and Subcontractors.
- D. Compatibility: Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes and for adjustment, repair, and replacement.
- E. Standards: Refer to Divisions 0 and 1 for general administrative/procedural requirements related to compliance with applicable standards. This Work and all materials shall meet the standards set forth in the applicable portions of the following recognized standards:
1. AEIC Association of Edison Illuminating Companies.
 2. ANSI American National Standards Institute.
 3. ASHRAE American Society of Heating, Refrigerating & Air-Conditioning Engineers.
 4. ASME American Society of Mechanical Engineers.
 5. ASPE American Society of Plumbing Engineers.
 6. ASSE American Society of Sanitary Engineering.
 7. ASTM American Society for Testing and Materials.
 8. AWS American Welding Society.
 9. CBM Certified Ballast Manufacturers.
 10. CDA Copper Development Association.
 11. CE Corps of Engineers (U. S. Department of the Army).
 12. EIA Electronic Industry Association.
 13. ETL Electrical Testing Laboratory.
 14. FAA Federal Aviation Administration (US Department of Transportation).
 15. FCC Federal Communications Commission.
 16. FM Factory Mutual Engineering Corporation.
 17. FS Federal Specification (General Services Administration).
 18. ICEA Insulated Cable Engineering Association.
 19. IEEE Institute of Electrical and Electronics Engineers.

20. IES Illuminating Engineering Society of North America.
21. IRI Industrial Risk Insurers.
22. LPI Lighting Protection Institute.
23. MIL Military Standardization Documents (US Dept. of Defense).
24. MSS Manufacturers Standardization Society of the Valve and Fittings Industry.
25. NEC National Electrical Code (by NFPA).
26. NECA National Electrical Contractor Association.
27. NEMA National Electrical Manufacturers Association.
28. NFPA National Fire Protection Association.
29. OSHA Occupational Safety Health Administration (US Department of Labor).
30. UL Underwriters' Laboratories, Inc.

1.04 SITE VISIT AND FAMILIARIZATION:

- A. General: Become familiar with the Drawings and Specifications, examine the premises, and understand the conditions under which the Contract shall be performed, prior to submitting a bid.
- B. Site: Be informed of the site conditions, verify locations of new and existing equipment, and determine exact requirements for connections.
- C. Coordination: Submission of a bid for this project infers that the Contractor has visited the site and has become familiar with the Drawings and site conditions and has included in his proposal, all work necessary to properly install the systems on the project.
- D. Pre-Bid Conference: Refer to Divisions 0 and 1.

1.05 DRAWINGS AND SPECIFICATIONS:

- A. General: The Drawings are schematic in nature and indicate approximate locations of the electrical systems, equipment, fixtures and devices, except where specific locations are noted and dimensioned on the Drawings. All items are shown approximately to scale. The intent is to show how these items shall be integrated into the project. Locate all items by on the job measurements and in accordance with the Contract Documents. Cooperate with other trades to ensure project completion as indicated.
- B. Location: Prior to locating electrical devices, light fixtures, and other items, obtain the Architect/Engineer's approval as to exact location. Locations shall not be determined by scaling Drawings. Mount lighting fixtures and electrical devices at the heights directed by the Architect/Engineer. Where there is a question concerning the required location for items of electrical work, the Contractor shall submit a request for information to the Architect/Engineer requesting specific directions for locating the item. Contractor shall be responsible for costs of redoing work of trades necessitated by failure to comply with this requirement.
 1. All electrical devices, lighting fixtures, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of building construction details, acoustical tile panels and other building features with respect to the mechanical and electrical outlets and devices. Electrical devices, fixtures, and outlets shall be referenced to such features as wall and ceiling furrings, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the centers of whole tiles and the exact location of each outlet and the arrangements to be

followed shall be acceptable to the Architect/Engineer. Outlets in wall tile or masonry construction shall occur symmetrically in the centers of whole tiles, bricks, or blocks and the exact location of each outlet and the arrangement to be followed shall be acceptable to the Architect/Engineer.

2. The Drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the Architectural Drawings and to all detail Drawings, equipment Drawings, rough-in Drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner and Architect/Engineer reserve the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.
- C. Specifications: The specifications are intended to supplement the Drawings and it is not in the scope of the specifications to mention any part of the work which the Drawings are competent to fully explain. Conversely, any part of the work which the specification are competent to fully explain, may not be mentioned on the Drawings.
- D. Disagreement: Disagreement between the Drawings or specifications or within the Drawings or specifications shall be estimated using the better quality or greater quantity of material or installation, and a request for information shall be made to the Engineer.

1.06 **DISCREPANCIES:**

- A. Clarification: Clarification shall be obtained before submitting a proposal for the Work under this Division as to discrepancies or omissions from the Contract Documents or questions as to the intent thereof.
- B. Detailed Instructions: Should it appear that the work hereby intended to be done or any of the materials relative thereto, is not sufficiently detailed or explained in the Drawings or Specifications, then the Contractor shall submit a request for information to the Engineer for such further Drawings or explanations as may be necessary before proceeding, allowing a reasonable time for the Engineer to respond. The Contractor shall conform to this additional information as a part of the Contract without additional cost to the Owner or Engineer.
- C. Interpretations: Should any doubt or question arise respecting the true meaning of Drawings or Specifications, reference shall be made to the Engineer, whose written decision shall be final and conclusive. No alleged statement by the Engineer will be accepted as an excuse for inferior work.
- D. Contractor Agreement: Consideration will not be granted for misunderstanding of the amount of work to be performed. Submission of a bid conveys full Contractor agreement of the items and conditions specified, shown, scheduled, or required by the nature of the project.

1.07 **UTILITIES:**

- A. General: Utility information shown on the Drawings have been shown based upon data obtained from the site survey and the agencies having jurisdiction and are accurate to the best of the knowledge of the Engineer.
- B. Coordination: The Contractor shall be responsible for field verification of the actual location of site and/or building utilities and shall make modifications necessary for connection to or construction around those utilities at no additional cost to the Owner or Engineer.
- C. Required Shop Drawing Submittals: Submit Shop Drawings, including, but not limited to the following items. Refer to individual specification sections for specific submittal requirements.
 1. Basic Materials and Methods Refer to Section 26 05 01.
 2. Low Voltage Conductors and Cable Refer to Section 26 05 19.

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| 3. Electrical Grounding | Refer to Section 26 05 26. |
| 4. Electrical Raceways | Refer to Section 26 05 33. |
| 5. Electrical Boxes | Refer to Section 26 05 34. |
| 6. Panelboards | Refer to Section 26 24 16. |
| 7. Wiring Devices | Refer to Section 26 27 26. |
| 8. Low Voltage Fuses | Refer to Section 26 28 13. |
| 9. Enclosed Circuit Breakers | Refer to Section 26 28 17. |
| 10. Exterior Lighting | Refer to Section 26 56 00. |
- D. Samples: Submit two samples, upon request, of electrical devices and materials for review by the Architect/Engineer. Samples will be returned upon written request of the Contractor.

1.08 MATERIALS AND WORKMANSHIP:

- A. General: Materials and equipment shall be new, of best grade and quality, and standard products of reputable manufacturers regularly engaged in the production of such materials and equipment.
- B. Workmanship: Work shall be executed and materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed.
- C. Manufacturer's Recommendations: With exceptions as specified or indicated on the Drawings or in the Specifications, apply, install, connect, erect, use, clean, and condition manufactured articles, materials, and equipment per manufacturer's current printed recommendations. Copies of such printed recommendations shall be kept at the job site and made available as required.

1.09 SPACE REQUIREMENTS:

- A. General: Determine in advance of purchase that the equipment and materials proposed for installation will fit into the confines indicated, leaving adequate code clearances for adjustments, repair, or replacement.
- B. Clearance: Allow adequate space for clearance in accordance with requirements of the Code and local inspection department.
- C. Scheduled Equipment: The design shown on the Drawings is based on the equipment scheduled.
- D. Responsibility: Since space requirements and equipment arrangement vary for each manufacturer, the responsibility for initial access and proper fit rests with the Contractor.
- E. Review: Final arrangements of equipment to be installed shall be subject to the Architect's review.

1.10 SAFETY REGULATIONS:

- A. All electrical work shall be performed in compliance with all applicable and governing safety regulations. All safety lights, guards, signs, and other safety materials and provisions required for the performance of the electrical work shall be provided by and operated by the Electrical contractor.

1.11 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

- A. General: Protect all materials and equipment to be installed under this Division from physical and weather damage.
- B. Scope: Work under this Division shall include, but not limited to:
 - 1. Shipping from point of manufacture to job site.
 - 2. Unloading, moving, and storage on site with proper protection as required to properly protect equipment from rust, drip, humidity, dust, or physical damage.
 - 3. Hoisting and scaffolding of materials and equipment included in this Division.
 - 4. Ensuring safety of employees, materials, and equipment using such hoisting equipment and scaffolding.
- C. Coordination: All large pieces of apparatus which are to be installed in the building and which are too large to permit access through doorways, stairways or shafts shall be brought to the job by the Contractor and shall be placed in the spaces before enclosing partitions and structure are completed. All apparatus shall be cribbed up from the floor by Contractor and shall be covered with tarpaulins or other protective covering where required for protection.

1.12 CLEANING, ADJUSTING AND START-UP:

- A. Start-up Services: Where specified for any individual item of electrical equipment, provide a factory-authorized representative for testing, start-up of equipment, and instruction of Owner's operating personnel. Certify that these services have been performed by including a properly executed invoice for these services or a letter from the manufacturer.
- B. Testing: Refer to Section 26 01 25, "Electrical Testing" for requirements.
- C. Clean-up: Each Contractor shall clean away from the job site all debris, surplus material, and similar items, resulting from his work or operations, leaving the job and equipment in a clean condition. Each Contractor shall thoroughly clean all pieces of equipment, conduit, boxes, fixtures, and similar items, leaving the installation in a first class condition.
- D. Operation Prior to Completion: When any piece of electrical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation, and has the Engineer's written permission to do so. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner, or date of substantial completion, whichever occurs first. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of final acceptance and the start of the warranty may not be the same date.

1.13 FINAL REVIEW:

- A. General: Upon completion of the Work, perform a final test of the entire system.
 - 1. The system shall be operating properly.
 - 2. After the final test, any changes or corrections noted as necessary for the Work to comply with these Specifications or the Drawings, shall be accomplished without delay in order to secure final acceptance of the Work.
 - 3. The date for the final test shall be sufficiently in advance of the Contract completion date to permit execution, before expiration of the Contract, of any adjustments or alterations which the final acceptance tests indicate as necessary for the proper functioning of all equipment. Any such modifications shall be completed within the time allotted for completion of the Contract. Retests shall be conducted as directed and shall be of such

time duration as necessary to ensure proper functioning of adjusted and altered items. Retests shall not relieve the Contractor of completion date responsibility.

4. Certificates, including certificates of occupancy from local authorities and documents required herein, shall be completely in order and presented to the Engineer at least one week prior to the review.

- B. Qualified Person: Individuals knowledgeable of the systems and persons approved by the Engineer, shall be present at this final inspection to demonstrate the system and prove the performance of the equipment.

1.14 OWNER INSTRUCTION:

- A. General: This Contractor and appropriate factory-trained representatives shall instruct the Owner's representative in the proper operation and maintenance of all systems and equipment and shall explain all warranties.
- B. Outline: Prior to instruction of Owner Personnel, prepare a typed outline, listing the subjects that will be included in this instruction, and submit the outline for review by the Engineer.
- C. Certification: At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the approved outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.
- D. Other Requirements: Refer to other Division 26, 27 and 28 Sections for additional Operator Training requirements.

1.15 CONTRACTOR WARRANTIES AND GUARANTEES:

- A. General: Contractor shall guarantee all material and equipment installed by him against defects in workmanship and material for a period of 24 months after final acceptance of the work by the Owner and he shall repair or replace any materials or equipment developing such defects within that time, promptly on due notice given him by the Owner and at Contractor's sole cost and expense.
- B. Equipment: All equipment bearing a manufacturer's guarantee, such as electrical equipment, devices, components, and similar items, shall be construed to have an extended guarantee to the Owner by the manufacturer. Any such equipment that proves defective in materials or workmanship within the guarantee period is to be replaced by the Contractor in accordance with the manufacturer's guarantee.
- C. Start-up: The Electrical Contractor shall provide instructions and equipment starting service on new equipment for one complete year after date of final acceptance of the work by the Owner, at Contractor's sole cost and expense.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION 26 00 01

E&C Engineers & Consultants Inc.
TX Firm Registration No. F-003068

SECTION 26 0125
ELECTRICAL TESTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 0001, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. General: Provide testing of electrical work installed under Divisions 26, 27, and 28, as specified herein and in other Division 26, 27 and 28 sections. Feeders and equipment shall not be placed in service until they have been checked out and tested, as applicable.

1.03 QUALITY ASSURANCE:

- A. Personnel: Submit evidence to show that the personnel who will actually test the systems are qualified.
- B. The Engineer reserves the right to require that the originally approved personnel be replaced with other qualified personnel if, in his opinion, the original personnel are not qualified or are not properly conducting the system testing.

1.04 SUBMITTALS:

- A. Testing Procedures: Submit four copies of all proposed testing procedures to the Engineer for review at least 30 days prior to conducting any testing.
- B. Reporting Forms: Submit four copies of proposed forms to be used in recording testing data and results to the Engineer for review at least 30 days prior to conducting any testing on the project.
- C. Test Data and Results: Submit four copies of complete data and certified test results for each test performed, including, but not limited to:
1. Test performed.
 2. Test procedure.
 3. System and area tested.
 4. Date(s) and time(s) of test.
 5. Weather conditions.
 6. Test criteria.
 7. Test results.
 8. Additional pertinent information.
- D. Operational Certification: Submit four certified copies of an operational certification which documents that all equipment and systems have been fully tested to verify proper operation in accordance with the design shown in the Construction Documents and manufacturer's recommendations.
- E. Certification: Certifications stating that submitted test data and results are true and correct shall be provided for all submittals under this Section. Certification shall be executed by an authorized officer if the Contractor is a corporation, by a partner if the Contractor is a partnership, by the Owner if the Contractor is a sole proprietorship or by the authorized representative if the Contractor is a joint venture.

- F. Calibration List: Submit four copies of a listing of testing devices to be used for the project to the Engineer for approval. Listing shall include documentation that devices are properly calibrated.
- G. Test Log: The Contractor shall maintain a test log at the site to document the results of all successful and unsuccessful testing and balancing as it is performed. This log shall be available for review by the Engineer and a copy of the log shall be submitted to the Engineer prior to the Substantial Completion inspection. A space shall be provided on the test log for signoff by the OR.

1.05 NOTICE:

- A. General: Notify the Engineer in writing two weeks prior all scheduled testing to allow time for Engineer to schedule witnessing of testing, where elected by the Engineer.

PART 2 PRODUCTS

2.01 TESTING MATERIALS:

- A. General: Provide all materials and test equipment required for testing of specified electrical systems, including retesting until acceptable test results are obtained.
- B. Products: Tested products which fail to provide acceptable test results shall be repaired or replaced with suitable materials as required to obtain acceptable test results.

PART 3 EXECUTION

3.01 TESTING:

- A. General: Tests shall be made during the course of construction as specified and as required by authorities having jurisdiction. Such tests shall be conducted by this Division as a part of the Work and shall include all personnel, material, and equipment required to perform tests until satisfactory results are obtained. Any defects detected during testing shall be satisfactorily repaired or the equipment involved shall be replaced and the tests re-executed.
- B. Tests: Testing shall include but not be limited to all items listed in other Sections of this Division and the following:
 - 1. Thermographic Testing: Conduct a thermographic test of the distribution panels, panelboards, automatic transfer switches and other electrical distribution apparatus and connections using an infrared temperature scanning unit. The test shall be performed by an independent testing laboratory (General Electric, Eaton Electrical Systems and Solutions or Siemens Industrial Service). Connections indicating higher temperature levels than are acceptable shall be tightened or corrected as required to eliminate the condition. Conduct test, using test reporting forms, between 6 and 8 months after beneficial occupancy, but in no case beyond the one year warranty period. Correct unacceptable conditions prior to end of the warranty period.
 - 2. Low Voltage Conductors and Cable Testing Refer to Section 26 05 19.
 - 3. Electrical Grounding Testing Refer to Section 26 05 26.
 - 4. Lighting Control Device Testing Refer to Section 26 09 23.
 - 5. Low-Voltage Lighting Control Testing Refer to Section 26 09 26.
 - 6. Low Voltage Transformer Testing Refer to Section 26 22 00.
 - 7. Panelboards Testing Refer to Section 26 24 16.
 - 8. Isolated Power Panels and Accessories Testing Refer to Section 26 24 18.
 - 9. Wiring Device Testing Refer to Section 26 27 26.
 - 10. Engine Generator Testing Refer to Section 26 32 13.
 - 11. Automatic Transfer Switch Testing Refer to Section 26 36 23.

12. Nurse Call/Code Blue System Testing
13. Addressable Device Fire Alarm System Testing

Refer to Section 27 52 23.

Refer to Section 28 31 03.

END OF SECTION 26 01 25

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TX Firm Registration No. F-003068

SECTION 26 0501
ELECTRICAL BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 0001, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide basic materials and methods for electrical construction as shown, scheduled, indicated, and specified.
- B. Types: The types of basic materials and methods required for the project include, but are not limited to:
 - 1. Manner of running conduits.
 - 2. Excavation, trenching, and backfilling.
 - 3. Cleaning and painting of electrical work.
 - 4. Prohibited markings.
 - 5. Tamper resistant fasteners.
 - 6. Equipment housekeeping pads and anchor bolts.
 - 7. Concrete.
 - 8. Wiring device.

1.03 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. The Contractor shall submit to the Engineer for review, a list of proposed manufacturers and product data on hangers, supports, and methods of attachment to the structure.
 - 2. Excavation and trenching plan designed and sealed by a registered professional engineer. Refer to Division 1 for additional submittal requirements.
 - 3. Cut sheets on access doors and fire stopping materials products.
 - 4. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver components in factory-fabricated water resistant packaging.
- B. Handle components carefully to avoid damage to components, enclosures, and finish.
- C. Store components in a clean, dry space and protect from weather.

PART 2 PRODUCTS

2.01 MATERIALS:

- D. General: Refer to PART 3 - EXECUTION of this Section and other Division 26 sections for basic electrical products and materials.

PART 3 EXECUTION

3.01 MANNER OF RUNNING CONDUITS:

- A. Run conduit to avoid proximity to heat producing equipment, piping and flues, keeping a minimum of 8" clear.
- B. Conduit and raceway connections, rough-in and stub-up locations for equipment shall be coordinated by the Contractor to provide locations indicated on approved manufacturers equipment shop drawings. Connection, rough-in and stub-up locations shown on the Drawings are diagrammatic for general reference only.

3.02 EXCAVATING, TRENCHING AND BACKFILLING:

- A. General: The work hereunder includes whatever excavating and backfilling is necessary to install the electrical work. Coordinate the electrical work with other work in the same area, including excavating and backfilling, dewatering, floor protection provisions, other temporary facilities, other underground services (existing and new), landscape development, paving, structural foundations, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.
- B. Standards: Except as otherwise indicated, comply with the applicable provisions of Division 2 for electrical work excavating and backfilling. Refer instances of uncertain applicability to the Architect/ Engineer for resolution before proceeding with the Work.
- C. The bottoms of trenches shall be excavated to required depths, slope and grade. The bottom of the trench shall be accurately excavated to provide firm, uniform bearing for the bottom of the raceways and ductbanks. Where mud or unstable soil is encountered in bottom of trench, it shall be removed to firm bearing and the trench shall be backfilled with bedding sand to proper grade and tamped to provide uniform firm support.
- D. The bottom of trenches shall be accurately graded to provide proper fall and uniform bearing and support for each section of the conduit on undisturbed soil or 2" of sand fill at every point along its entire length. In general, grading for electrical ductbanks and conduits shall be from building to manhole, and from a high point between manholes to each manhole.
- E. Exercise care not to excavate below required depth, leaving a flat bed of undisturbed earth, firm and secure, before laying cable, and ductbanks. In the event rock is encountered, excavate 6" below required depth and backfill to required depth with bedding sand, and compact to minimum 95% compaction.
- F. All grading in the vicinity of excavation shall be controlled to prevent surface ground water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other acceptable method. During excavation, material suitable for backfilling shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted and removed from the site and properly disposed of.
- G. The Contractor shall be fully responsible for the safety of persons, materials and equipment in or near trenches or other excavations and provide all required sloping, shoring, railings and other protective provisions. The Contractor shall provide a trench shoring plan and design which is sealed by a registered professional engineer for all trenching greater than 4 feet in depth. Refer to Divisions 1 and 2 for additional requirements.
- H. If any unknown and/or uncharted utilities are encountered during excavation, promptly notify Architect/ Engineer and wait for his instructions before proceeding.
- I. If such unknown utilities are encountered and work is continued without contacting the Architect/ Engineer for instructions, and damage is caused to said utilities, the Contractor shall repair at his own expense, such damage to the satisfaction of the owner or utility company concerned.
- J. Trenches shall not be backfilled until all required tests have been made by the Contractor and approved by the Architect/Engineer and any local authorities having jurisdiction.
- K. Backfill shall be compacted or cement stabilized sand up to 6" above the top of conduit or ductbank. Backfill up to grade shall be in maximum 6" lifts with minimum 95% compaction of lifts. Refer to Division 2 or elsewhere in Contract Documents for additional trenching and backfill requirements.
- L. Opening and Reclosing Pavement, Landscape Areas and Lawns: Where excavation requires the opening of existing walks, street, drives, other existing pavement or lawns, such surfaces shall be cut as required to install new conduit and to make new connections to existing conduits. The sizes of the cut shall be held to a minimum, consistent with the work to be

accomplished. After the installation of the new work is completed and the excavation has been backfilled and flooded, the area shall be patched or replaced, using materials to match those cut out or removed. Patches shall thoroughly bond with the original surfaces, shall be level with them, and shall meet all the requirements established by the authorities having jurisdiction over such areas. All removed work shall be replaced by craftsman who regularly install the types of work being replaced.

- M. Excavation in Vicinity of Trees: All trees including low hanging limbs within the immediate area of construction shall be adequately protected to a height of at least 5' to prevent damage from the construction operations and/or equipment. All excavation within the outermost limb radius of all trees shall be accomplished with extreme care. All roots located within this outermost limb radius shall be brought to the attention of the Architect before they are cut or damaged in any way. The Architect will give immediate instructions for the disposition of same. All stumps and roots encountered in the excavation, which are not within the outermost limb radius of existing trees, shall be cut back to a distance of not less than 18" from the outside of any concrete structure or pipeline. No chips, parts of stumps, or loose rock shall be left in the excavation. Where stumps and roots have been cut out of the excavation, clean compacted dry bank sand shall be backfilled and tamped.

3.03 PROHIBITED MARKINGS:

- A. Prohibited Markings: Markings which are intended to identify the manufacturer, vendor, or other source from which the material has been obtained are prohibited for installation within public, tenant, or common areas within the project. Also prohibited are materials or devices which bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters' Laboratories, Inc.), and approval labels are exceptions to this requirement.

3.04 TAMPER RESISTANT FASTENERS:

- A. All exposed fasteners utilized [inside psychiatric units] shall be of a tamper resistant design. All fasteners shall be of the same type whenever possible. Coordinate fastener selection with other trades to provide similar fastener types whenever possible. A minimum of three tools for use with each type of tamper resistant fastener shall be furnished to the Owner at the time of substantial completion.

3.05 EQUIPMENT HOUSEKEEPING PADS AND ANCHOR BOLTS:

- A. Concrete pads for equipment (Housekeeping Pads) will be furnished under this Division. Pads shall be provided [in the central plant and in other] in locations where floor mounted equipment is to be installed.
- B. Pads shall be [nominal 5-1/2" high in the central plant and] nominal 3-1/2" high [in all other locations] and shall extend a minimum of 3" beyond all equipment and supports while generally conforming to the shape of the equipment. Provide pad heights to match existing pads where located in the same room.
- C. Pads shall be minimum 2500 psi (28 day) concrete reinforced with No. 6 - 6" x 6" welded wire mesh. Pad tops and sides shall be hard troweled smooth with a 3/4" bull nose on all external corners. Refer to Division 3 for additional requirements.
- D. Furnish galvanized anchor bolts with layout templates for installation in equipment pads. Bolts shall be of the size and quantity recommended by the manufacturer and where vibration isolators are used, they shall be anchor bolted to the equipment pad.

3.06 CONCRETE:

- A. All concrete used in light pole bases and ductbank encasement shall be 5 sack mix with 1/2" maximum aggregate and 3000 psi compressive strength when tested after 28 days in accordance with ASTM 039-44, "Standard Method of Test for Compressive Strength of Concrete". Refer to other Divisions for additional requirements.

- B. Add 8 pounds of L. Sonneborn Sons, Inc. "Sonobrite Red" or and approved equal dye per cubic yard of wet mix ductbank encasement concrete to form a uniform red color throughout the concrete.
- C. Use forms except where the earth is firm enough to support the concrete. Above grade portions of pole bases shall be formed using Sonatube or an approved equal forming system.
- D. Keep concrete wet at least 48 hours after forms are removed to ensure proper curing.
- E. Ductbanks and light pole bases shall be reinforced where noted on the Drawings.
- F. Ductbank concrete shall be carefully spaded during the pouring to eliminate all voids under and between the ducts and to prevent honeycombing of the exterior surfaces. Power driven tampers or agitators shall not be used unless specifically designed for the application.
- G. Generally, each run of the ductbank shall be poured in one continuous operation. Where more than one pour is necessary, each pour shall terminate in an angular plane, and reinforcing rod dowels shall be added as necessary to ensure a sound joint. Partial pours shall not terminate in horizontal or vertical planes.
- H. The concrete encasement covering the ductbank may be poured directly against the sides of the trenches if the cut is clean enough, and free of loose material. All loose dirt and extraneous material shall be removed from the trenches before and during the pouring of the concrete to ensure sound envelopes. The trench bed shall be smooth and properly graded for the placement of the bottom row of spacers.

END OF SECTION 26 05 01

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SECTION 26 0519
LOW VOLTAGE CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide low voltage electrical conductor, cable, wire, and connector work as shown, scheduled, indicated, and as specified.
- B. Types: The types of low voltage electrical conductor, cables, wire, and connectors required for the project include, but are not limited to, the following:
1. 600 volt wire and cable.
 2. 300 volt control/signal wire and cable.
 3. 300 volt control/signal wire and cable connectors.
- C. Application: The applications for cable, wire, and connectors required on the project are as follows:
1. Power distribution circuitry.
 2. Lighting branch circuitry.
 3. Appliance, receptacle and equipment branch circuitry.
 4. Control wiring.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. ANSI/ICEA S-95-658/NEMA WC70 – Nonshielded 0-2kV Cables
 2. ASTM B3 - Standard for Specification for Soft or Annealed Copper Wire for Electrical Purposes – 2001 (Reapproved 2007).
- B. Where application of applicable codes, Trade Association standards, or publications appears to be in conflict with the requirements of this Section, an interpretation shall be obtained from the Architect/ Engineer.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
1. 600 Volt Building Wire and Cable:
 - a. Cerro Wire and Cable Company.
 - b. Colonial Wire and Cable.
 - c. Encore Wire Corporation.
 - d. General Cable Corporation.
 - e. Okonite Company.
 - f. Republic Wire Inc.
 - g. Southwire Company.
 - h. United Copper Industries.
 2. 300 Volt Wire and Cable:
 - a. Alpha.
 - b. Belden.
 - c. West Penn.

3. Connectors:
 - a. AMP, Inc.
 - b. Buchanan.
 - c. Burndy Corporation.
 - d. O. Z. Gedney Company.
 - e. General Electric Company.
 - f. Ideal Industries, Inc.
 - g. Mac Products, Inc.
 - h. Minnesota Mining and Manufacturing Company (3M).
 - i. Penn-Union.
 - j. Thomas & Betts Company.
- B. UL Label: All cable, wire, and connectors shall be UL-labeled.

1.05 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 1. The Contractor shall submit to the Engineer for review, a list of the proposed manufacturers of wire and cable, cable lugs, cable connectors and termination fittings listed herein. The Contractor may install wire and cable, cable lugs, cable connectors and termination fittings furnished by any manufacturer listed on the approved submittal.
 2. Cut sheets on all 300 and 600 volt conductors with manufacturers name, ratings and capacities, insulation characteristics, and available colors, clearly listed.
 3. Cut sheets indicating all cable lugs, termination fittings and cable connectors.
 4. Cut sheets indicating types of conductor identification bands.
 5. Additional information as required in Section 26 00 01, "Electrical General Provisions"..

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable; and weather resistant fiberboard containers for factory-packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire, or connectors shall be removed from project site.
- B. Store cable, wire, and connectors in their factory-furnished coverings, and in a clean, dry indoor space which provides protection against the weather.

PART 2 - PRODUCTS

2.01 600 VOLT BUILDING CABLE, WIRE AND CONNECTORS:

- A. General: Except as otherwise indicated, provide cable, wire, and connectors of manufacturer's standard materials, as indicated by his published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.
- B. Wire and Cable: Provide factory-fabricated wire and cable of the size, rating, material, and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. The minimum size wire to be used for power or lighting circuits shall be No. 12 copper (No. 14 for light fixture pigtails) with insulation as noted below. Minimum size for control wiring shall be No. 14 copper.
- C. Conductors: Provide soft or annealed copper wires meeting, before stranding, the requirements of ASTM B3, "Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes", latest edition.
 1. Conductors for power wiring sized No. 10 AWG and smaller shall be stranded or solid at the Contractors option, except that solid conductors shall be provided where conductors are terminated under terminal screws and stranded conductors shall be provided for connections to vibrating or movable equipment. Stranded conductors may be terminated on back wired wiring devices where wiring is mechanically secured via a side screw. Conductors for control wiring sized No. 10 AWG and smaller shall be stranded, except

that solid conductors or stranded conductors with UL Listed crimp on connectors shall be provided where conductors are terminated under terminal screws.

2. Conductors sized No. 8 AWG and larger shall be stranded. Stranding shall be Class B meeting the requirements of ASTM B8, "Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft".
- D. Insulation: Insulation shall meet or exceed the requirements of UL 83, "Standard for Thermoplastic Insulated Wires".
 1. Insulation for conductors sized No. 10 AWG and smaller shall be UL Type "THHN/THWN" (rated at 90°C in dry locations and 75°C in wet locations).
 2. Insulation for conductors sized No. 8 AWG and larger shall be UL Type "THHN/THWN" (rated at 90°C in dry locations and 75°C in wet locations).
 3. All wiring inside lighting fixtures shall be temperature rated per the NEC.
 4. Branch circuit wiring within 3" of fluorescent ballasts shall be temperature rated for 90°C.
- E. Connectors for Building Wire and Cable: Provide factory-fabricated, metal connectors of the size, rating, material, type, and class required for each use.

2.02 300 VOLT CONTROL/SIGNAL CABLE, WIRE AND CONNECTORS:

- A. General: Except as otherwise indicated, provide cable, wire, and connectors of manufacturer's standard materials, as indicated by his published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.
- B. Wire and Cable: Provide factory-fabricated wire and cable of the size, rating, material, and type as indicated for each use.
- C. Conductors: Provide soft or annealed copper wires as individual conductors, twisted together or shielded, where required, and meeting, before stranding, the requirements of ASTM B3, "Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes", latest edition.
- D. Conductor Gauge: Provide conductor gauge as required for the application with a minimum of 24 AWG. Conductors shall be stranded or solid as required by the application or manufacturer.
- E. Insulation: Insulation shall meet or exceed the requirements of UL 83, "Standard for Thermoplastic Insulated Wires", and the requirements of NEC Article 725 for Class 2 wiring.
 1. Insulation shall be rated for a maximum working voltage of 300 volts; PVC jacket; UL-listed.
 2. Insulation of cables used in environmental air spaces shall be nonmetallic jacket UL-listed for use in air plenums.
- F. Connectors: Provide factory-fabricated, metal connectors of the size, rating, material, type, and class required for the application.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. General: Install electrical cable, wire and connectors as shown, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, the NECA's "Standard of Installation", and recognized industry practices to ensure that products serve the intended functions.
- B. Coordination:
 1. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.
 2. Installer shall examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect wire and cable for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.
- C. 600 Volt Building Wire and Cable:

1. Mains and feeders are to be run their entire length in continuous pieces without joints or splices[, unless otherwise indicated or noted].
2. Conductors may be run in multiple on sizes No. 1/0 AWG through 600 kcmil inclusive, provided all multiple conductors are the same size, length, and type of insulation, and are so arranged and terminated as to ensure equal division of the total current between all conductors involved.
3. Before any wire is pulled into any conduit, the conduit shall be thoroughly swabbed in such a manner as to remove all foreign material and to permit the wire itself to be pulled into a clean, dry conduit. All conductors shall be pulled into the conduit at the same time.
4. Cables shall be selected on the basis of their purpose and UL-listing. Generally, use Types "THWN" and "THHN" in building interiors and other dry locations. Outdoors and underground in raceways, use Type "THWN". Conductors subject to abrasion, such as in lighting poles, shall be Type "THWN" or "THHN".
5. Feeder conductors shall be sized such that the voltage drop from the source to the load served shall not exceed 2% at maximum load and 80% power factor, at 120/208 volts and 1% at maximum load and 80% power factor at 277/480 volts.
6. Where pulling lubricant is required, use only non-wax based cable lubricants equal to American Polywater as a lubricant. Wire pulling lubricant shall not be used when installing branch circuit conductors from panelboards with "isolation" transformers.
7. Pull all conductors together when more than one conductor is being installed in a raceway. Where more than six power conductors are installed in a single conduit, a conductor derating factor per NEC Table 310-15(B)(2)(a) shall be applied to conductor ampacity.
8. The use of shared branch circuit neutrals is not permitted. Separate neutral conductors shall be pulled for all branch circuits served by single pole and where required for 2 and 3 pole circuit breakers.
9. No conductor smaller than No. 12 AWG shall be used for power or lighting purposes (except light fixture tails). Switch legs shall be No. 12 AWG. Control circuit wiring may be No. 14 AWG minimum, and shall not be run in same conduit with power wiring.
10. Lighting and power branch circuit conductors shall be sized such that the voltage drop from the panelboards to the farthest point on the circuits shall not exceed 2% at maximum load and 80% power factor, at 120/208 volts and 1% at maximum load and 80% power factor at 277/480 volts.
11. For 120 volt, 20 amp branch circuits with a length of 75' or more to the homerun junction box or first outlet, provide minimum No. 10 AWG conductors to the homerun junction box or first outlet. Where the additional circuit length from the homerun junction box or first outlet to the last outlet exceeds 75', provide minimum No. 10 AWG conductors to the last outlet.
12. For 208 volt, 20 amp branch circuits with a length of 100' or more, provide minimum No. 10 AWG conductors for the entire branch circuit.
13. For 208 volt, 30 amp branch circuits with a length of 100' or more, provide minimum No. 8 AWG conductors for the entire branch circuit.
14. For 277 volt, 20 amp branch circuits with a length of 150' or more, to the first outlet provide minimum No. 10 AWG conductors to the center of the load (minimum first outlet, where there is only one outlet).
15. Lighting fixtures shall not be used for raceways for circuits other than parallel wiring of fixtures.
16. All conductors in vertical conduits or raceways shall be supported in the manner set forth in the latest edition of the National Electrical Code.
17. Do not use a pulling means, including fish tape, cable, or rope which can damage the raceway.
18. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

19. Install exposed wire and cable, parallel and perpendicular to surface or exposed structural members and follow the surface contours, where possible.
 20. All wire on this project shall be new, unused, in good condition, and shall be delivered in standard coils, package, or rolls. Samples of all wire shall be submitted by the Contractor when requested by the Engineer for the purpose of determining acceptability of the wire.
 21. Wire which has been rejected by the Engineer shall not be used again. Decisions as to the quality of the wire furnished and the acceptance of such wire shall be made by the Owner's duly authorized representative.
 22. Do not permit conductors entering or leaving a junction or pull box to deflect so as to cause pressure on the conductor insulation.
 23. Splices and taps on branch circuits shall occur only when such circuits divide as shown on the drawings and shall consist of one "through" circuit to which the circuit shall be spliced or tapped. Through wiring of receptacles and other devices is not allowed, except for GFI devices noted on the drawings to protect downstream devices.
 24. Connections to devices (receptacles, switches, etc.) shall be made with individual conductors. The devices shall not be used for "feed-thru" purposes. Where "feed-thru" conditions exist, use "pig-tail" splices as described above. Color coding of "pig-tail" splices shall conform to Section 26 05 03, "Identification for Electrical Systems".
 25. No splices or taps shall be made in any conductor except in outlet boxes, junction boxes, splice boxes, or other devices and equipment in exposed and accessible locations approved for the purpose by the latest edition of the NEC.
 26. All wire connections or splices on conductors No. 18 AWG through No. 8 AWG shall be made with pre-insulated spring type connectors. No other type of mechanical connector shall be used for No. 8 AWG and smaller conductors.
 27. All No. 6 AWG and larger copper conductors which are to be spliced or tapped in wireways, gutters, or junction boxes shall be spliced or tapped using hydraulically applied, high conductivity compression connectors, or with set-screw type pressure connectors approved for the purpose, using 3-M electrical tape or manufactured connector covers approved for the purpose.
 28. The manufacturer's recommended installing tool shall be used for the installation of all hydraulically applied compression type lugs or connectors.
 29. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure. Include bridle rings or drive rings.
 30. Multiple circuit wires in bundles or harnesses terminating in control panels, switchboards, panelboards, etc., shall be loosely bundled, trained, and laced to achieve a neat and workmanlike appearance.
 31. Surplus wire shall be trimmed to proper length. Do not fold and stuff surplus wires into wiring gutters.
 32. Wires exiting harness shall be trained at 90 degree angles to termination point.
 33. Refer to Section 25 05 53, "Identifications for Electrical Systems" for color coding and identification of conductors.
- D. 300 Volt Control/Signal Cable and Wire:
1. Install all low voltage wiring in a suitable raceway except in areas with accessible (lay-in) ceilings unless otherwise noted on Drawings or other Division 26 sections. Where cable is routed without a raceway, bundle all cables and suspend to one foot above ceiling using loop rings on 5' centers. Do not run cable loose on top of suspended ceilings. Do not attach cables to suspended ceiling supports or any mechanical, plumbing, or sprinkler piping. Conceal conduit except in mechanical rooms and areas where other conduit and piping are exposed. Fasten flexible conductors, which bridge cabinets and doors, neatly along hinge side and protect against abrasion. Tie and support the conductors neatly.
 2. Remote control wires shall be no smaller than No. 14 AWG. Control wires shall be run in separate conduits. Departures from the sizes so determined shall be made only in those cases in which the National Electrical Code required the use of larger conductors. The

sizes as determined from these tables shall be regarded as the acceptable minimum under all other circumstances. In no case, however, shall there be a voltage drop greater than that specified in any feeder or branch circuit. This voltage drop shall be based on the full load, 70% power factor, the total impedance drop of 60 Hz alternating current and with the reactance drop in the respective metal conduits duly considered. The Contractor may, if he deems it necessary or advisable, use larger sized conductors than those shown. Under no circumstances, however, shall the Contractor use any conductors sized in a manner which does not conform to the above mentioned tables without having first secured the written approval of the Owner's duly authorized representative.

3. Number code or color code conductors appropriately for future identification and servicing of the system. Refer to Section 26 05 53, "Identification for Electrical Systems", for additional requirements.
4. Make all splices and connections in stranded conductors using UL-approved solderless crimp connectors.

3.02 TESTING:

- A. Feeder Insulation Resistance Test: Each new [and reused existing] 600 volt feeder conductor shall have its insulation resistance tested after the installation is complete except for connection at its source and point of termination.
1. Tests shall be made using a Biddle Megger or equivalent test instrument at a voltage of not less than 1000 volt dc. Resistance shall be measured between phase, neutral, and ground conductors and from conductors to raceway (ground). Readings shall be taken after 30 seconds and 60 seconds of Megger operation at slip speed and insulation resistance shall not be less than the following:

<u>Wire Size (AWG)</u>	<u>Insulation Resistance (Ohms)</u>
No. 12	1,000 K
No. 10 through No. 8	250 K
No. 6 through No. 2	100 K
No. 1 through No. 4/0	50 K
Larger than No. 4/0	25 K
 2. New conductors which do not meet or exceed the insulation resistance values listed above shall be removed, replaced, and retested.
 3. [Where reused existing feeders fail to meet the above insulation requirements, notify the Engineer in writing for direction prior to placing the existing feeders back in service.]
- B. Neutral Testing: After all feeder and branch circuit conductors are terminated, neutral to ground testing shall comply with the following:
1. The resistance of the system's neutral to ground shall be greater than 10 Kohms with the system bonding jumper disconnected.
 2. Repeat neutral to ground test for neutrals of separately derived systems.
- C. Pre-energization Check: Prior to energization, check all new [and reused existing] branch circuit cable and wire for continuity of circuitry and for short circuits. Correct malfunction when detected. No submittal is required for this test.
- D. Voltage and Current Values: The voltage and current in each main feeder conductor shall be measured and recorded after all connections have been made and the feeder is under load.
- E. Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit four copies of certified test results to Architect for review. Test reports shall include conductor tested, date and time of test, test results, relative humidity, temperature, and weather conditions. Refer to Section 26 01 25, "Electrical Testing", for additional requirements.

3.03 AS BUILT DRAWINGS:

- A. As-Built Drawings: Refer to Section 26 00 01, "Electrical General Provisions", for applicable requirements.

3.04 IDENTIFICATION:

- A. Identification: Refer to Section 26 05 53, "Identification for Electrical Systems", for color-coding and markings for all conductors and cables.

END OF SECTION 26 05 19
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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide electrical service, distribution, and equipment grounding as shown, scheduled, indicated, and as specified.
- B. Types: The types of electrical service and equipment grounding specified in this Section include, but are not necessarily limited to, grounding all equipment and devices shown and as required by the National Electrical Code (NEC), the local electrical inspection department, and The Power Company.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following Standards:
 - 1. ANSI/IEEE Standard 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. ANSI/UL 467 - Safety Standard for Grounding and Bonding Equipment.
 - 3. NFPA 70 - National Electrical Code (NEC).

1.04 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with Article 250 of the NEC for grounding.
- B. Approval: All grounding shall be in accordance with the requirements of, and shall be subject to the approval of the Engineer and the local electrical inspection department.
- C. UL Label: All grounding products shall be UL-labeled.
- D. Manufacturers: Provide grounding products complying with these specifications and as manufactured by Copperweld and Cadweld.

1.05 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Cut sheets of grounding products.
 - 2. Additional information as required in Section 26 00 01, "Electrical General Provisions" ..

1.06 STORAGE AND HANDLING:

- A. Store grounding products in a clean, dry space.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: For each electrical grounding connection, provide a complete assembly of materials to construct a completely grounded electrical system.
- B. Raceways: Raceways for grounding conductors shall be as specified in Section 26 05 33 "Electrical Raceways", and Section 26 05 34, "Electrical Boxes".
- C. Cable, Wire, and Connectors: Grounding cable, wire and connectors shall be as specified in Section 26 05 19, "Low Voltage Conductors and Cables".
- D. Ground Clamps: Ground clamps for connecting grounding conductors to copper, brass, or lead pipes shall be made of copper and if pipes are of steel or iron, the ground clamps should be made of galvanized iron. These clamps shall be designed to provide permanent and positive pressure and to avoid mechanical injury to the pipe. Use exothermic welds for connecting

ground wires to ground rods, for all below grade counterpoise ground grids, and elsewhere where noted on the Drawings.

- E. Ground Conductors and Jumpers: Grounding conductors and jumpers shall be connected to each other and to items to be grounded by means of approved type pressure connectors, clamps and other suitable methods approved by the Engineer. No solder connections shall be made.
- F. Grounding Electrode Rods: Grounding electrode rods used shall be a minimum of 3/4" diameter by 10' long, steel core and thick copper jacket. All concrete encased or direct buried underground grounding electrode conductors shall be of lead alloy-coated copper, Class B, stranded, conforming to ASTM A189.
- G. Exothermic Welds: Use cadweld or an approved equal system of exothermic welding for welded grounding connections where shown on the Drawings or specified.

PART 3 EXECUTION

3.01 INSTALLATION OF ELECTRICAL GROUNDING:

- A. General: Install grounding connections as shown and specified, in accordance with applicable portions of the NECA's "Standard of Installation", and recognized industry practices to ensure that products serve the intended functions.
- B. Grounding Electrode System: Each service neutral and ground bus shall be connected to grounding conductor and bonded to a ground rod. Grounding conductor shall be sized as shown and shall be run in conduit.
- C. System Neutral: The system neutral shall be grounded to the grounding electrode system at the service entrance only.
- D. Miscellaneous: Provide bonding and grounding wires run in conduit and sized per the NEC in accordance with the local electrical inspection department and the NEC. Metallic piping and duct systems which enter the building shall be grounded at the point of entry to the building, in accordance with the NEC.
- E. Continuity: Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquidtight flexible metal and flexible metal conduit, light fixture pigtails in excess of 6', and all other non-electrically continuous raceway fittings.
- F. Main Conductors: All main grounding conductors shall be stranded copper conductors, sized as shown or per the NEC, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.
- G. Special Grounding: Provide special grounding systems where shown on the Drawings.
- H. Rigid Nonmetallic Conduit Systems: Install a continuous grounding conductor in accordance with NEC.
- I. Feeder and Branch Circuits: Provide a separate, insulated equipment grounding conductor in each feeder or branch circuit. Terminate each end on a grounding lug, bus, or bushing.
- J. Power Feeders: Ground the raceway, shield (where applicable), armor (where applicable), and ground conductors in 5/15 kV and 600 volt power feeders in accordance with the NEC. Bond all pull boxes and splice boxes in accordance with the NEC.
- K. Branch Circuits: Install an insulated ground wire, sized per the NEC, in all branch circuits.

3.02 COORDINATION:

- A. General: Coordinate installation of grounding connections for equipment with equipment installation work. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

- B. Connections: Use exothermic welds for connecting bonding and grounding conductors to ground rods, to counterpoise, structural steel, piping systems, and elsewhere where shown on the Drawings. Provide all accessories required for a complete installation.

3.03 TESTING:

- A. Ground Resistance Test: Perform a ground resistance test on the building grounding systems for comparison to future inspection and testing data by the Owner. Service ground resistance shall not exceed 5 ohms. Overall system resistance shall not exceed 15 ohms. Test shall be performed using a Biddle Megger or equivalent test instrument operated in accordance with the test instrument manufacturers operating/test procedure. Test readings shall be taken after 30 and 60 seconds of Megger operation at slip speed. The test shall not be performed immediately following wet weather conditions.
- B. Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit two copies of certified test results for Owner's record and submit four copies of certified test results to Architect for review. Test reports shall include date and time of tests, relative humidity, test results, temperature, and weather conditions.

END OF SECTION 26 05 26
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SECTION 26 0533
ELECTRICAL RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide electrical raceway and fitting work as shown, scheduled, indicated, and specified.
- B. Conduit Systems: All electrical conductors shall be installed in conduit. Conduit shall be as specified herein.
- C. Types: The types of electrical raceways and fittings required for the project include, but are not limited to, the following:
1. Rigid steel (RGS) and intermediate metal conduit (IMC).
 2. PVC-coated rigid steel conduit.
 3. Flexible metal conduit.
 4. Liquidtight flexible metal conduit.
 5. Rigid nonmetallic conduit.

1.03 STANDARDS:

- A. Products and installation shall comply with applicable sections of the following standards:
1. ANSI C80.1 Rigid Steel Conduit, Zinc-Coated.
 2. ANSI C80.6 Intermediate Metal Conduit, Zinc-Coated.
 3. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.
 4. ANSI/NEMA FB 1 Fittings and Supports for Conduit and Cable Assemblies.
 5. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
1. Rigid Steel and Intermediate Metal Conduit:
 - a. Allied Tube & Conduit Corporation.
 - b. Republic Steel Corporation.
 - c. Western Tube
 - d. Wheatland.
 2. PVC-coated Rigid Steel:
 - a. CalConduit.
 - b. KorKap.
 - c. Plasti-Bond.
 - d. Perma-Cote.
 - e. Thomas&Betts Ocal.
 3. Flexible Metal and Liquidtight Flexible Metal:
 - a. AFC.
 - b. Alflex
 - c. Anaconda Metal Hose.
 - d. Electri-Flex Company.
 - e. Flexi-Guard, Inc.
 - f. Wheatland.
 4. Rigid Nonmetallic Conduit and Innerduct:

- a. Carlon.
 - b. Cantex.
 - c. Triangle PWC, Inc.
 5. Raceway Fittings:
 - a. Appleton Electric Company.
 - b. Cantex (PVC).
 - c. Carlon (PVC).
 - d. Crouse Hinds.
 - e. Efcor Division.
 - f. O. Z. Gedney Company.
 - g. Raco, Inc.
 - h. Republic Steel Corporation.
 - i. Steel City.
 - j. Thomas and Betts.
 6. Precast Manholes, Pull Boxes and Accessories:
 - a. Brooks.
 - b. A. B. Chance.
- B. UL Label: All electrical raceways and fittings shall be UL-listed and labeled.
- C. NEMA Compliance: All electrical raceways and fittings shall comply with NEMA standards applicable to raceway construction.
- D. NEC Compliance: All electrical raceways and fittings shall comply with NEC requirements applicable to construction and installation.

1.05 SUBMITTALS:

- A. Shop drawing submittals shall include, but not be limited to, the following:
1. The Contractor shall submit to the Engineer for review, a list of the proposed manufacturers of electrical raceways and fittings selected from the manufacturers listed herein. The Contractor may install conduit and fittings furnished by any manufacturer listed on the approved submittal.
 2. Cut sheets of electrical raceways and fittings.
 3. Manufacturers data on manholes, pull boxes and accessories.
 4. Additional information as required in Section 26 00 01, "Electrical General Provisions" ..

1.06 STORAGE AND HANDLING:

- A. Handle raceways and fittings carefully to avoid damage, breaking, denting and scoring. Damaged materials shall not be installed.
- B. Store raceways and fittings in a clean dry space and protect from the weather.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General:
1. Provide metal conduit, tubing, and fittings of the type, grade, size, and weight (wall thickness) as shown and required for each service. Where type and grade are not indicated, provide proper selection determined by this Section to fulfill the wiring requirements and complying with the NEC for electrical raceways.
 2. For each electrical raceway system indicated, provide a complete assembly of conduit, tubing, or duct with fittings, including, but not necessarily limited to, connectors, nipples, couplings, expansion fittings, bushings, locknuts, other components and accessories as needed to form a complete system of the type indicated.
 3. Conduit fittings shall be designed and approved for the specific use intended. Conduit fittings, including flexible, shall have insulated throats or bushings. Rigid conduits shall have insulated bushings, except insulated throat grounding bushings shall be used on all conduits without ground conductors and where required by N.E.C. Article 250.

- B. Rigid Steel or Intermediate Metal Conduit: Rigid Steel shall be UL 6 and ANSI C80.1, hot-dipped galvanized steel. Intermediate Steel shall be UL 1242 and ANSI C80.6, hot-dipped galvanized steel. Both ends of conduits shall be threaded with factory-installed thread protectors. Fittings shall be threaded Type UL 6/1242 and ANSI C80.1 and C80.6, hot-dipped galvanized steel. Expansion fittings shall be OZ Type "DX", Appleton Type "XJ", Crouse-Hinds Type "XC" or an approved equal and shall have bonding jumpers.
- C. PVC Externally-Coated Rigid Steel Conduit: Shall be ANSI C80.1 hot-dipped galvanized rigid steel conduit with an external 0.040" minimum PVC protective coating per NEMA Standard RN1. Both ends of conduit shall be threaded and thread protectors shall be factory-installed. Fittings shall be threaded type ANSI C80.4, hot-dipped galvanized with a 0.055" minimum PVC coating to match the conduit.
- D. Flexible Conduit:
 - 1. Flexible Metal Conduit: UL 1, zinc-coated steel
 - 2. Flexible Metal Conduit Fittings: UL 1, zinc-coated steel, insulated throat.
 - 3. Liquidtight Flexible Metal Conduit: Liquidtight flexible metal conduit comprised of single strip, continuous, flexible, interlocked, double-wrapped steel, galvanized inside and outside; forming smooth internal wiring channel; with liquidtight jacket of flexible polyvinyl chloride (PVC) or neoprene.
- E. Liquidtight Flexible Metal Conduit Fittings: UL 1, liquidtight, zinc-coated steel, neoprene gaskets and O-rings, insulated throat.
- F. Nonmetallic Conduit and Fittings:
 - 1. Schedule 40 Rigid PVC Conduit: Per UL 651, and NEMA TC 2, 90°C conductor temperature rating.
 - 2. Schedule 80 Rigid PVC Conduit: Per UL 651 and NEMA TC 2, 90°C conductor temperature rating.
 - 3. Type "EB" Encased Burial PVC Conduit: Per UL 651A and NEMA TC 8, ASTM F512 - heavy wall, 90°C conductor temperature rating.
 - 4. PVC Conduit Fittings: Per NEMA TC 3 and compatible with PVC conduit system.
- G. Conduit Tubing Accessories: Provide ANSI/NEMA FB I conduit and tubing accessories including straps, hangers and expansion joints as recommended by the conduit and tubing manufacturer and as specified in this Section.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. General: Install electrical raceways and fittings as shown, in accordance with the manufacturer's written instructions, the applicable requirements of the NEC, and in accordance with recognized industry practices to ensure that products serve the intended function. Complete electrical raceway installation before starting the installation of wire and cable.
- B. Rigid Steel and Intermediate Metal Conduit: Use rigid steel or intermediate metal conduit to run all electrical raceway systems where exposed to weather; in damp or wet locations; where subject to physical damage.
- C. PVC-coated Rigid Steel: Use polyvinyl chloride (PVC) externally-coated rigid steel conduit and fittings for electrical raceway systems for branch circuits to wet areas; where exposed outdoors; and elsewhere, as shown. Conduit and fittings shall be installed such that the PVC-coating is continuous and watertight such that no portion of the metal conduit or fittings is exposed to moisture.
- D. Flexible Metal: Use flexible metal conduit (with internal ground wire) and fittings for lay-in lighting fixture connections and for other electrical equipment connections where subject to movement and vibration, but where liquidtight flexible metal conduit is not specified. Use flexible metal conduit in such lengths as required, 6'-0" maximum length and 3'-0" minimum length. 1/2" diameter conduit may be used for lighting fixture "pigtailed".

- E. Liquidtight Flexible Metal: Use liquidtight flexible metal conduit and fittings for all motor connections, all connections in kitchens and laundries, computer equipment branch circuits below raised floors, and for other electrical equipment connections where subject to movement and vibration and when subject to one or more of the following conditions: exterior location; moist or humid atmosphere where condensate can be expected to accumulate; corrosive atmosphere; subject to water spray; subject to dripping oil, grease or water. Install [external ground wire on] [internal ground wire in] flexible conduit with grounding bushings. Maximum length shall be 6'-0" and minimum length shall be 3'-0".
- F. Rigid Nonmetallic: Use PVC conduit directly buried in earth, concrete encased, cast in concrete slabs, and where subject to corrosive environment. PVC conduit shall only be used where shown on the Drawings. Use Schedule 40 where direct buried and Schedule 80 where exposed, with size adjusted to have same fill area as if Schedule 40 were used. Type "EB" encased burial duct shall be used in concrete encased applications where shown on the Drawings.
- G. Rigid Nonmetallic: No exposed conduit shall be PVC. Conduit shall be Type "II" designated for underground installation with or without concrete encasement. Conduit system shall be UL-listed in accordance with Article 347 of the NEC. Conduit smaller than 1/2" in diameter will not be permitted.

3.02 EXTERIOR CONDUIT SYSTEMS:

- A. Exterior conduit systems shall meet all of the general installation requirements for interior conduit systems.
- B. All exterior conduit systems shall be completely watertight. All hangers, fasteners, and supports used with exterior conduit systems shall be hot dip galvanized.

3.03 PULL BOXES:

- A. Install pull boxes in accordance with the manufacturer's written installation instructions.
- B. Seal all joints and openings to prevent the entry of water.

3.04 IDENTIFICATION:

- A. General: Refer to Section 26 05 53, "Identification for Electrical Systems", for requirements concerning painting and marking of raceways and fittings.

END OF SECTION 26 05 33

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SECTION 26 0534
ELECTRICAL BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide electrical box and fitting work as shown, scheduled, indicated, and as specified.
- B. Types: The types of electrical boxes and fittings required for the project include, but are not limited to, the following:
 - 1. Junction boxes.
 - 2. Pull boxes.
 - 3. Cabinets.
 - 4. Conduit bodies.
 - 5. Bushings.
 - 6. Locknuts.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
 - 1. ANSI/NEMA OS 1 -Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
 - 2. NEMA 250 -Enclosures for Electrical Equipment (1000 Volts Maximum).

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
 - 1. Weatherproof Outlet Boxes:
 - a. Appleton Electric Company.
 - b. Crouse-Hinds Company.
 - c. Harvey Hubbell, Inc.
 - d. Pyle-National Company.
 - e. Raco
 - f. Red Dot.
 - 2. Junction and Pull Boxes:
 - a. Appleton Electric Company.
 - b. Arrow-Hart, Inc.
 - c. O. Z. Gedney Company.
 - d. General Electric Company.
 - e. Hoffman Engineering Company.
 - f. Keystone Columbia, Inc.
 - g. Square D Company.
 - h. Unity.
 - 3. Cabinets:
 - a. General Electric Company.
 - b. Hoffman Engineering Company
 - c. Square D Company.
 - d. Westinghouse.
 - 4. Conduit Bodies:
 - a. Appleton Electric Company.
 - b. Crouse-Hinds Company.

- c. Killark Electric Manufacturing Company.
- d. Pyle-National Company.
- 5. Bushings, Knockout Closures and Locknuts:
 - a. Allen-Stevens Conduit Fittings Corporation.
 - b. Allied Metal Stamping, Inc.
 - c. Appleton Electric Company.
 - d. Carr Company.
 - e. Raco, Inc.
 - f. Steel City, Midland-Ross Corporation.
 - g. Thomas and Betts Company, Inc.
- B. UL Label: All electrical boxes and fittings shall be UL-labeled.

1.05 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. The Contractor shall submit to the Engineer for review, a list of proposed manufacturers of electrical boxes and fittings selected from the manufacturers listed herein. The Contractor may install electrical boxes and fittings furnished by any manufacturer listed on the approved submittal.
 - 2. Cut sheets of electrical boxes and fittings.
 - 3. Cut sheets on cabinets.
 - 4. Drawings of any special boxes which must be fabricated, including construction details.
 - 5. Additional information as required in Section 26 00 01, "Electrical General Provisions"..

1.06 STORAGE AND HANDLING:

- A. Handle electrical boxes and fittings carefully to avoid damage, breaking, denting, and scoring. Damaged equipment or materials shall not be installed.
- B. Store electrical boxes and fittings in a clean dry space and protect from weather.

PART 2 PRODUCTS

2.01 FABRICATED MATERIALS:

- A. Weatherproof Outlet Boxes: Provide hot-dipped galvanized cast iron weatherproof outlet wiring boxes, of the type, shape, and size, including depth of box, with threaded conduit ends, cast metal coverplate with spring-hinged waterproof caps suitably configured for each application, including face plate gasket and corrosion resistant fasteners.
- B. Junction and Pull Boxes: Provide galvanized sheet steel junction and pull boxes, with screw-on covers and welded seams with stainless steel nuts, bolts, screws and washers, of the type, shape, and size, to suit each respective location and installation.
 - 1. Type for Various Locations:
 - a. 100 Cubic Inches in Volume or Smaller: Standard outlet boxes with stamped knockouts.
 - b. 150 Cubic Inches in Volume or Larger: Code gauge steel with sides formed and welded, screw covers unless shown to have hinged doors. Hinged doors with locking device same as furnished on panelboards. Knockouts factory-stamped or formed in field with a cutting tool to provide a clean symmetrically-cut hole.
 - c. Exterior or Wet Areas: Weatherproof galvanized steel construction with proper gaskets and corrosion resistant fasteners. A parking garage is considered a wet area.
- C. Cabinets: Provide cabinets of size and style noted on the Drawings.
 - 1. Cabinet fronts shall be steel. Other sheet metal for boxes shall be galvanized steel. Details of construction and methods of assembly shall meet the requirements of the Underwriters' Laboratories, Inc.
 - 2. The panel doors of cabinets shall be provided with locks. Single panel doors of cabinets shall have a lock with ring pull. Single doors 48" or longer and pairs of doors shall have a

- lock with vertical bolt operation, 3-point locking. Locks shall be keyed alike. Two keys shall be supplied for each cabinet.
3. Cabinets shall have concealed hinges.
 4. Flush-mounted trim shall be fastened to cabinet with adjustable trim clamps. Fasteners for cabinets in concealed areas shall be concealed.
 5. Each voice/data cabinet shall be equipped with 3/4" plywood backboard covering entire inside rear surface and painted matte white.
 6. Trims and doors shall have a suitable primer coat and a finish coat of the manufacturer's standard color.
- D. Conduit Bodies: Provide galvanized cast metal conduit bodies, of the type, shape and size, to suit each respective location and installation, constructed with threaded conduit ends, removable cover, and corrosion resistant screws.
- E. Bushings, Knockout Closures, and Locknuts: Provide corrosion resistant punched-steel box knockout closures, conduit locknuts, gasketed locknuts, insulated conduit bushings and insulated grounding conduit bushings of the type and size to suit each respective use and installation.

PART 3 EXECUTION

3.01 INSTALLATION OF BOXES AND FITTINGS:

- A. Install electrical boxes and fittings as shown, in compliance with NEC requirements, or in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes and fittings serve the intended purposes.
- B. Determine from the Drawings and by actual determination on the site, the exact location of each outlet. The outlet locations shall be modified from those shown to accommodate changes in door swings or to clear other interferences that may arise from job construction details, as well as modification to center them within room spaces. These modifications shall be made with no change in contract price and shall be a matter of job coordination. Check these conditions throughout the entire job and notify the Architect of discrepancies, as they may occur, to verify the modifications, if any, before proceeding with the installation of the work. Set wall boxes in advance of wall construction, blocked in place and secured. Set all wall boxes flush with the finish and install extension rings as required to extend boxes to the finished surfaces of special furring or wall finishes.
- C. Install outlet boxes at heights as specified in Section 26 05 01, "Electrical Basic Materials and Methods".
- D. On exposed conduit systems provide pull boxes, junction boxes, wiring troughs, and cabinets wherever necessary for proper installation of various electrical systems.
- E. Provide weatherproof boxes for exterior locations exposed to weather or moisture.
- F. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- G. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- H. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly imbed boxes in concrete or masonry. Boxes shall not be permitted to move laterally. Boxes shall be secured between two studs. Two gang (single or double device) boxes may be connected to one stud using an approved bracket, except where specific dimensioned locations must be met. Box recessing depths shall comply with Article 314.24 of the National Electrical Code.
- I. Provide junction and pull boxes for feeders and branch circuits where shown and where required by the NEC, regardless of whether boxes are shown or not.
- J. Switch boxes shall not be used as junction boxes.

- K. Refer to Section 26 05 53, "Identification for Electrical Systems", for applicable painting and marking of electrical boxes.

END OF SECTION 26 05 34
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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide identification for electrical systems as shown, scheduled, indicated, and specified.
- B. Types: The types of identification for electrical systems required for the project include, but are not limited to:
 - 1. Electrical system identification.
 - 2. Warning signs and operational tags.
 - 3. Cleaning and painting of electrical work.

1.03 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Cut sheets and samples of Electrical System Identification products.
 - 2. Additional information as required in Section 26 00 01, "Electrical General Provisions"..

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver components in factory-fabricated water resistant packaging.
- B. Handle components carefully to avoid damage to components, enclosures, and finish.
- C. Store components in a clean, dry space and protect from weather.

PART 2 PRODUCTS

2.01 MATERIALS:

- A. General: Refer to PART 3 - EXECUTION of this Section and other Division 26 sections for basic electrical products and materials.

PART 3 EXECUTION

3.01 ELECTRICAL SYSTEM IDENTIFICATION:

- A. Identification of Equipment:
 - 1. All pieces of major electrical equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Care shall be taken not to obliterate this nameplate in any way.
 - 2. The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, junction boxes, etc., by marking them. All items of equipment, pull boxes, junction boxes, etc., shall be clearly marked using engraved nameplates as hereinafter specified. The item of equipment shall indicate the same number as shown on the Drawings, where applicable.
 - 3. Equipment nameplates shall be three ply laminated plastic, a minimum of 3/32" thick, black-white-black for normal power, red-white-red for emergency power, and blue-white-blue for UPS power. Letters shall be similar to Roman Gothic of a size that is legible (1/2" minimum for main nameplates and 3/8" minimum for branch device nameplates) and appropriate to the application. Attachment of nameplates shall be by stainless steel screws. Rivets or adhesives are not acceptable.
 - a. Electrical equipment to be identified includes: All distribution panels, transformers, motor control centers, panelboards, automatic transfer switches, disconnect switches,

motor controller/starters, lighting control panels, pull boxes, junction boxes, and similar equipment.

- b. Nameplates on automatic transfer switches, transformers, distribution panels, motor control centers, disconnect switches, motor controller/starters, and panelboards shall give voltage and current characteristics and the source feeding the panel. Current characteristics shall indicate the size of the overcurrent devices serving the equipment and not the equipment current rating.

Example:

PANEL 1LA
120/208V, 3 PH, 4 W, 225 A
Fed from DPA-3
Room 1.102

- c. Individual overcurrent devices and pilot lights in distribution panels, motor control centers, and similar equipment shall have nameplates showing the load served and its location, where remote. Nameplates on motor starters shall indicate variable speed, time delay operation, etc., where applicable.
 - d. Blank nameplates shall be mounted on each spare or bussed space in motor control centers, and on each spare or space in distribution panels.
 - e. Branch circuit panelboards shall have neatly typed circuit directories behind clear plastic. Identify circuits by room numbers. Room numbers shall be those finally selected by the Owner; not necessarily those given on contract Drawings. Spares and spaces shall be indicated with erasable pencil; not typed. Circuit numbers shall be provided in the directory and at each circuit breaker.
- B. Conduit Systems: Provide adequate marking of major conduit which is exposed or concealed in accessible spaces, to distinguish each run as either a normal power, emergency power, fire alarm, control wiring or voice/data conduit. Except as otherwise indicated, use orange banding with black lettering except that emergency power and fire alarm conduit markers shall use red banding. Provide self-adhesive or snap-on type plastic markers. Indicate voltage ratings of conductors exceeding 250 volts. Locate markers at ends of conduit runs, near switches and other control devices, near items of equipment served by the conductors, at points where conduit passes through walls or floors, or enters non-accessible construction and at spacings of not more than 50' along each run of exposed conduit. Switch-leg conduit and short branches for power connections need not be marked, except where conduit is larger than one inch (1").
- C. Underground Cable Identification: Bury a continuous, preprinted, bright colored plastic ribbon cable marker, Brady No. 91600 Series or an approved equal with each underground cable (or group of cables), regardless of whether conductors are in conduit or direct buried. Locate each directly over cables, 6" to 8" below finished grade. Ribbons shall be detectable from above grade using a pipe or cable locator.
- D. Cable/Conductor Identification: Coordinate a uniform and consistent scheme of color identification of power wiring throughout the building system. Identification shall be by the permanent color of the selected covering. On large conductors, secure identification by means of painted color banding or plastic tape.

1. Color scheme shall be as follows, [or as required to match the existing color coding in the building for 120/240 V systems with high leg provide Orange for phase B]:

	<u>208/120 Volt</u>	<u>480/277 Volt</u>	<u>5 kV/15 kV</u>
Phase A	Black	Brown	Black
Phase B	Red	Purple	Red
Phase C	Blue	Yellow	Blue
Neutral	White	Gray	White
Ground	Green	Green	

2. Wiring for switches shall be same color as phase wire.
 3. Colored insulation in sizes up through No. 10. Conductors No. 8 and larger may have black insulation, but color coded with 1/2" wide band of colored tape, at accessible locations.
 4. Feeder cables shall be tagged in pull boxes, wireways, wiring gutters of panels, and at other accessible locations. Tags shall be fireproof, nonconductive material, approved by Architect.
 5. Maintain same conductor color from service entrance to last device.
- E. Phase Rotation: Phase rotation shall be maintained throughout the project.
1. Phase rotation shall be clockwise or counterclockwise, per serving power company standards, A-B-C, and identified as such left-to-right, top-to-bottom, and front-to-back with color coding as specified above at switchboards, panelboards, substations, transformers, motor control centers, motor starters, and similar locations.
 2. Motor phase reversal, if necessary, shall be made at motor terminals.
- F. Branch Circuit and Control Wiring Tags: All branch circuit and control wiring conductors shall be tagged using self-sticking vinyl cloth or mylar cloth wire markers. Embossed pressure sensitive plastic or metal ribbon markers will not be accepted. Tags shall be installed at all wiring splice, tap and termination points and shall correspond to the designations shown on the control wiring diagrams or panel schedules.
- G. Branch Circuit Pull Boxes and Junction Boxes: Branch circuit pull boxes shall be neatly stenciled with a black permanent marker indicating the panel name and branch circuit number. Boxes on emergency power systems shall be painted red prior to marking.
- H. Manufacturers: Provide electrical identification products as manufactured by Ideal, T&B, 3M, Panduit, Seaton, EMED Co. or an approved equal.

3.02 WARNING SIGNS AND OPERATIONAL TAGS:

- I. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with recognized industry standards for color and design.
- J. Operational Tags: Where needed for proper and adequate information on operation and maintenance of electrical systems, provide tags of plasticized card stock, either preprinted or hand printed. Tags shall convey the message, example: "DO NOT OPEN THIS SWITCH WHEN BURNER IS OPERATING".

3.03 CLEANING AND PAINTING OF ELECTRICAL WORK:

- K. All equipment and materials furnished by the electrical subcontractor shall be delivered to the job with suitable factory protective finish.
- L. Paint all ferrous metal surfaces without a protective finish and not galvanized with two coats of zinc chromate primer as the construction progresses to protect against deterioration.
- M. Before painting, all surfaces to be painted shall be suitably prepared. Remove all oil, rust, scale, dirt, and other foreign material. Make surfaces smooth by grinding, filing, brushing, or other approved method. In the painting operations, the primer for metal surfaces shall be of the zinc dust type unless specified otherwise, and where finish painting is specified, it shall be

painted using materials and colors selected and approved by the Landscape Architect/Owner.
Coordinate with the Landscape Architect and Owner for additional requirements.

END OF SECTION 26 05 53
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SECTION 26 05 73
SHORT CIRCUIT ANALYSIS /FAULT STUDY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF THE WORK:

- A. The Short Circuit Analysis, and Arc Flash and Electrical Hazard Studies specified in this section shall be completed and submitted prior to submitting submittals for distribution panels, panelboards, enclosed circuit breakers and other electrical gear with short circuit or interrupting ratings.
- B. The Electrical Contractor shall provide the Engineer with a Power System Short Circuit Analysis and Arc Flash and Electrical Hazard Study. These analysis's and studies shall include all power distribution systems, beginning at the electric service point from the Electric Utility Company to the secondary buses of each panelboard as described hereafter.
- C. Shall be prepared by and certified with a registration seal and signature of a Registered Professional Engineer. The Engineer shall be qualified by experience in preparation of studies having similar requirements and of similar magnitude to that specified in this section of the Specifications.
- D. The Short Circuit Analysis shall terminate at each branch bus at the lowest utilization voltage secondary bus where the symmetrical short circuit RMS amperes, total source plus all motor contribution, is less than 10,000 amperes for 208/240 volts and 14,000 amperes for 480 volts. It is the intent of these Specifications to determine all locations in the entire electrical system where the symmetrical short circuit amperes meets or exceeds 10,000 amperes at 208 volts and 14,000 amperes at 480 volts. The short circuit analysis shall compare interrupting rating of all installed electrical protective devices connected to each bus included in the study with that of the available fault current at the load terminals of each protective device. Appropriate recommendations shall be made for corrective action in the conclusions of the report where the interrupting rating of electrical equipment is exceeded by the available fault current.
- E. The Protective Device Coordination Study shall start at the electric service and include all electrical distribution equipment.
- F. The Arc Flash and Electrical Hazard Study comply with applicable NEC and OSHA requirements and shall include calculating the Arc Flash and establishing the Electrical Hazard rating for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
- G. The Contractor shall obtain all lengths of cable from the electrical drawings and, where not shown the entire length of the run, from Contractor estimated lengths to longest possible lengths. All other equipment ratings shall be obtained by the Contractor from the equipment manufacturer's and/or suppliers.
- H. Short Circuit Analysis: The Analysis shall include the following:
 - 1. A schematic one-line drawing of the entire electrical system included in the study, from the power company system including the point of delivery, to each primary transformer, and including all main secondary buses of each transformer included in the study. Secondary buses shall include multiple secondary transformations within the scope of the study. Each device shall be identified using project assigned identification labels. Each motor 10 hp and larger shall be shown and identified. Each bus shall be assigned an identification number.
 - 2. Source voltage and impedance data shall be given in the analysis, including reactance and resistance in OHMS to the source, and available symmetrical and asymmetrical short

- circuit amperes at the point of delivery of electrical power. Short circuit amperes shall be based on an assumed bolted 3 phase short circuit.
3. At each bus, including buses of all primary protective and switching devices, primary and secondary of all transformers, all secondary main and feeder breakers, and all secondary devices and panelboards within the scope of the study, the following shall be calculated for assumed bolted 3 phase short circuits.
 - a. Symmetrical RMS short circuit amperes, calculated using total source and motor contribution reactance and resistance values.
 - b. Asymmetrical average 3 phase RMS amperes at 1/2 cycle, calculated using actual total source and motor contribution X/R ratio.
 - c. Reactance ("X") and Resistance ("R") in OHMS at the voltage of the device being examined, including both The Power Company source and all motor contributions.
 4. Calculation sheets for cable sections shall indicate voltage, wire size, cable length, reactance and resistance of the section in OHMS and total "X" and "R" to the source.
 5. Calculation sheets for transformer sections shall indicate transformer kVA, secondary voltage, percent impedance, percent reactance, percent resistance, and total "X" and "R" value in OHMS at the secondary voltage to source, including The Power Company source impedance plus any primary motor contribution.
 6. Calculation sheets for busway and miscellaneous devices shall provide all pertinent parameters including operating voltage, section "X" and "R" values in OHMS, and total "X" and "R" values in OHMS to the source, based on source impedance plus any motor contribution.
 7. Bus summary sheets shall be provided giving consecutive bus numbers, description, voltage, "X" and "R" values in OHMS including The Power Company plus all motor contributions, symmetrical and asymmetrical short circuit amperes, X/R ration, and asymmetrical factor.
 8. Motor summary sheets shall provide motor description and all pertinent motor data including subtransient reactance for each motor 10 hp and larger. Symmetrical short circuit amperes shall be given for each motor at the motor terminals.
 9. An evaluation of the adequacy of the short-circuit ratings of the electrical equipment supplied by that manufacturer. For this evaluation, circuit breakers shall all be fully rated or series rated as shown on the drawing panel schedules.
 10. All information shall be presented in a report form, signed and sealed by the engineer providing the analysis.
- I. Arc Flash & Electrical Hazard Analysis: The Analysis shall include the following:
1. The Arc-Flash & Electrical Hazard Analysis (AFEHA) shall be performed in accordance with the requirements of NFPA 70 Section 110.16, NESC ANSI C2-2007 Section 410.A.3, IEEE Std. 1584 and OSHA 29 CFR 1910.132(d) and 1910.335.
 2. The AFEHA shall:
- J. Calculate incident energy levels and flash protection boundaries at all relevant equipment busses based on available short-circuit current, protective device clearing time and other applicable one-line diagram information.
- a. Calculate the Minimum Arc Fault Current, Arc Flash Boundary and Arc Fault Rating (cal/cm^2) for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - b. Identify the Arc Flash Hazard Category and risk of personnel injury as a result of exposure to incident energy released during an arc flash event for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - c. Identify the current appropriate ratings of personal protective equipment (PPE) for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.

- d. Establish the Flash Protection Boundary (approach limit distance) as required by NFPA 70E for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
- e. Provide equipment specific environment and chemical arc-flash hazard warning label requirements per NEC Section 110.16 for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project, including all information specified to be provided on individual equipment warning labels.
- f. Provide recommendations and methods to mitigate the hazard risk, where applicable, in order to reduce PPE requirements
- g. All information shall be presented in a report form, signed and sealed by the engineer providing the analysis.

1.03 STUDY AND ANALYSIS SEQUENCE:

- A. All studies and analysis specified herein shall be completed and submitted with electrical distribution equipment submittals to allow the Engineer to review submitted electrical distribution equipment for interrupting rating, coordination and arc flash related coordination.

1.04 QUALITY ASSURANCE:

- A. The short circuit analysis/coordination study shall be performed by the Engineering Department of the electrical equipment supplied for the project or by a qualified engineering consultant approved in writing in advance by the Engineer.

1.05 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 1. Four copies of the Short-Circuit Analysis including, but not limited to:
 - a. A printout of input data, calculated results and an explanation of how to interpret the data.
 - b. A one-line diagram identifying all bus locations and the maximum available short-circuit current at each bus.
 - c. A bus-to-bus listing of the maximum available short-circuit current expressed in RMS symmetrical amperes and the X over R ratio of that fault current.
 - d. A table of specified equipment short-circuit ratings versus calculated short-circuit current values with notations of locations where are specified equipment short-circuit ratings are less or greater than required at the point of application.
 - e. An analysis of the results in which any overrating or inadequacies shall be called to the attention of the Engineer and recommendations made for improvements.
 2. Four copies of the arc-flash & electrical hazard analysis including, but not limited to:
 - a. Minimum Arc Fault Current, Arc Flash Boundary and Arc Fault Rating (cal/cm²) for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - b. Arc Flash Hazard Category and risk of personnel injury as a result of exposure to incident energy released during an arc flash event for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - c. Current appropriate ratings of personal protective equipment (PPE) for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - d. The Flash Protection Boundary (approach limit distance) as required by NFPA 70 for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch to be installed on the project.
 - e. Equipment specific environment and chemical arc-flash hazard warning label requirements per NEC Section 110.16 for each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch

- to be installed on the project, including all information specified to be provided on individual equipment warning labels.
- f. Recommendations and methods to mitigate the hazard risk, where applicable, in order to reduce PPE requirements
 3. Cut sheets and submittal information on the Arc Flash warning labels being provided.
 4. Additional information as required in Section 26 00 01, "Electrical General Provisions".

PART 2 - PRODUCTS

2.01 ARC FLASH WARNING LABELS:

- A. Labels: Seton Write-On Arc Flash Warning Labels or an approved equal labels with NEC and OSHA required warning information and with Arc Flash Hazard Category, minimum Personal Protection Equipment (PPE) required and Minimum Arc Rating (cal/cm²) clearly indicated.

PART 3 - EXECUTION

3.01 PROTECTIVE DEVICE SELECTION AND SETTING:

- A. Settings and Selection: Prior to project Substantial Completion, the Contractor shall set all relays, overcurrent devices and ground fault protection devices and confirm selection of fuse overcurrent devices as follows:
 1. Relays: Reset all adjustable relay settings from the factory default settings to the settings recommended in the studies specified in this section.
 2. Circuit Breakers: Reset all adjustable trip settings from the factory default settings to the settings recommended in the studies specified in this section.
 3. Ground Fault Protection Devices: Reset all adjustable device settings from the factory default settings to the settings recommended in the studies specified in this section.
 4. Fuses: Confirm that fuse types installed on the project are as recommended in the studies specified in this section.
- B. Certification: Prior to project Substantial Completion, the Contractor shall submit 4 signed copies of a document certifying that the Contractor has completed the settings and selection scope specified in Paragraph 3.1 A. to the Engineer.

3.02 AVAILABLE FAULT CURRENT LABEL:

- A. Building Service entrance equipment shall be provided with a permanently affixed label listing the maximum available fault current at the time of installation and the date the fault current calculation was performed, per NEC 110.24. The label shall be 2" x 3" in size and shall be blue lettering on a contrasting background.

3.03 ARC FLASH WARNING LABELS:

- A. Installation: Arc Flash warning labels shall be securely affixed to each switchboard, distribution panel, panelboard, automatic transfer switch, enclosed circuit breaker and disconnect switch in a readily visible location in accordance with NEC and OSHA requirements. The actual calculated Minimum Arc Rating (cal/cm²) for that individual piece of equipment along with the associated Arc Flash Hazard Category and minimum Personal Protection Equipment (PPE) required shall be clearly indicated on each warning label

END OF SECTION 26 05 73
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SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide panelboard and enclosure work, including cabinets, as shown, scheduled, indicated, and as specified.
- B. Types: The types of panelboards and enclosures required for the project include, but are not limited to, the following:
1. Lighting and appliance panelboards.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. NEMA AB 1 Molded Case Circuit Breakers.
 2. NEMA KS 1 Enclosed Switches.
 3. NEMA PB 1 Panelboards.
 4. NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
1. Cutler-Hammer, Inc.
 2. General Electric Company.
 3. Square D Company.
 4. Siemens.
- B. UL Standards: Panelboards and enclosures shall conform to all applicable UL standards and shall be UL-labeled.

1.05 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
1. Cut sheets of the circuit breaker and fusible switch distribution panels and panelboards with construction, fuse and circuit breaker amperage and poles, interrupting ratings, and quantities clearly listed, and with bus amperage, voltage, phase and wires, integrated equipment ratings and all associated accessories clearly indicated.
 2. Include dimensioned drawings of panelboards and enclosures. Submit, if requested, transparencies of circuit breaker characteristics with unlatch times and fuse characteristics with melting/clearing times.
 3. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver distribution panels and panelboards in factory-fabricated water-resistant wrapping.
- B. Handle panelboards carefully to avoid damage to material component, enclosure and finish.
- C. Store distribution panels and panelboards in a clean, dry space and protect from the weather.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: Lighting and appliance panelboards shall be dead front safety type equipped with molded case circuit breakers as shown and scheduled. Power distribution panelboards shall be dead front type equipped with fusible switches or circuit breakers as shown and scheduled.
- B. Busing Assembly: Panelboard and power distribution panel board busing shall be tin or silver-plated copper. Bus structure and mains shall have ratings as shown and scheduled and shall be phase sequence construction. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or busbar not to exceed 65°C rise above 40°C ambient. Heat rise test shall be conducted in accordance with UL 67. The use of conductor dimensions will not be accepted instead of actual heat tests. All bus joints shall be bolted with medium carbon steel, zinc or cadmium plated hardware equipped with lock washers and torqued to the manufacturer's recommended settings (usually ASTM standards). All bolted connections shall have Belleville washers. Furnish a bare uninsulated or an isolated, where noted, ground bus inside each 208Y/120 volt panelboard enclosure and elsewhere where noted on the Drawings. Furnish an isolated full size neutral bus, insulated where noted, in all panels where the neutral is present. All multi-section panelboards shall be connected with copper cable, with an ampacity meeting or exceeding the main bus ampacity. All distribution and 120/208 volt panels shall have a ground bus. All 277/480 volt panels shall have a ground bus where a ground wire is shown in the panel feeder or branch circuits.
- C. Neutrals: All panels serve by K-rated or phase cancellation transformers shall have 200% rated neutral.
- D. Molded Case Circuit Breakers:
1. Circuit breakers shall be of the molded case, thermal magnetic type equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Tripped indication shall be clearly shown by the breaker handle taking a position between "ON" and "OFF". Provisions for additional breakers shall be such that no additional connectors will be required to add breakers. Circuit breakers shall bolt in to the main bus for 480/277 volt panels (except Square D I-line panels which shall have plug-in breakers) and [plug] [bolt] on to the main bus for 208/120 volt panels. All 2 and 3-pole breakers shall have common trips. Where "series rated" breakers are shown, scheduled or specified and the manufacturer does not have a series rated breaker combination for the application shown, fully rated breakers with the required minimum interrupting capacity shall be provided.
 2. All single-pole circuit breakers shall be either ambient or case-compensated (calibrated 40°C) thermal-magnetic type breakers, with inverse time delay on overloads and instantaneous magnetic trip on short circuits. (Twin, tandem and half-size single-pole breakers and breaker tie handles are not acceptable.) All multiple breakers shall be common trip, thermal-magnetic type, calibrated 40°C.
 3. The breakers shall employ quick-make, toggle mechanism for manual operation, as well as automatic operation. The breakers shall have provisions for manually testing the tripping mechanism with the breaker removed from the panel. Automatic tripping shall be indicated by the breaker handle assuming a clearly distinctive position from the manual "on" and "off" positions.
 4. Circuit breakers used as switches in 120 volt and 277 volt fluorescent lighting circuits, the circuit breakers shall be approved for such switching duty and shall be marked "SWD".
 5. Provide panelboard circuit breakers with conventional interrupting capacity unless scheduled shown or noted otherwise, but in no case less than the following symmetrical amperes RMS:

<u>Voltage (volts)</u>	<u>Interrupting Capacity</u>
120/208	10,000 AIC
277/480	14,000 AIC

6. Provide distribution panel circuit breakers with conventional interrupting capacity unless scheduled shown or noted otherwise, but in no case less than the following symmetrical amperes RMS:
- | <u>Frame Size/Voltage (volts)</u> | <u>Interrupting Capacity</u> |
|-----------------------------------|------------------------------|
| 100AF to 225AF/240V | 10,000 AIC |
| 400AF to 1000AF/240V | 42,000 AIC |
| 1200AF/240V | 100,000 AIC- |
| 100AF/480V | 18,000 AIC |
| 225AF/480V | 25,000 AIC |
| 400AF to 1000AF/480V | 30,000 AIC |
| 1200AF/480V | 50,000 AIC |
7. Current limiting thermal-magnetic circuit breakers suitable for interrupting currents up to 200,000 amperes shall be provided where scheduled or specified. Current limiting breakers shall have a non-fusible type independently operating limiter section in series with each pole which shall automatically reset after circuit interruption. Current limiting circuit breakers shall be equal to Square D Company "I-LIMITER".
8. Ground fault interrupter (GFI) circuit breakers, where shown, shall be 5 ma ground fault trip and shall include a TEST button.
- Adjustable ground fault delay
 - Adjustable ground fault pick-up
- E. Integrated Equipment Rating: Each panelboard, as a complete unit, shall have short circuit bracing and a short-circuit rating equal to the interrupting rating of the weakest overcurrent device installed in the panelboard. This rating shall equal or exceed the rating shown, scheduled or noted on the Drawings. Such ratings shall have been established by tests on similar panelboards with the circuit breakers installed.
- F. Short Circuit Bracing: Distribution panel bussing shall have short circuit bracing as shown, scheduled or noted on the drawings and this rating shall be clearly indicated on the distribution panel nameplate.

PART 3 EXECUTION

3.01 INSTALLATION OF PANELBOARDS:

- General: Install panelboards as shown, including electrical connections, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, the NECA's "Standard of Installation", and recognized industry practices to ensure that products serve the intended function.
- Coordination: Coordinate installation of panelboards and enclosures with cable and raceways installation work. Verify that wall thickness is adequate where recessed panels are shown.
- Circuit Arrangement: Branch circuit connections to 3-phase lighting and appliance panelboards shall be arranged such that when two or three circuits are run with a common neutral, each circuit shall be connected to a different phase unless otherwise shown. At the completion of the electrical system this Contractor shall check each phase of all panels under full load and arrange so that all phases shall carry the same load as near as possible.
- Spare Conduits: Stub three empty one inch (1") conduits to accessible location above ceiling out of each recessed panelboard.

3.02 TESTING:

- General: Prior to energization, check for continuity of circuits and for short circuits.
- Thermographic Testing: Refer to Section 26 01 25, "Electrical Testing", for thermographic testing.

3.03 IDENTIFICATION:

- A. Identification: Refer to Section 26 05 53, "Identification for Electrical Systems", for applicable painting, nameplates, and labeling requirements.

END OF SECTION 26 24 16
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SECTION 26 27 01
ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. General: The electrical service shall be at 480/277 volts, 3-phase, 4-wire, 60 Hz, and shall be obtained from Centerpoint Energy (CPN) hereafter called "The Power Company".
- B. Power Company Data: Obtain from The Power Company all required information and installation standards to furnish a complete electrical service installation and make all arrangements required to obtain electrical service.
- C. Responsibilities: Division 26 shall be responsible for determining which equipment and labor is by The Power Company, which is by Division 26, and shall be responsible for any charges by The Power Company for service installation. Make all arrangements necessary to obtain electrical service from The Power Company. Obtain all necessary standards and detail drawings from The Power Company before construction of service equipment is commenced. The Power Company service data as shown is accurate as determined on the date of Specification issue and shall be verified as specified hereinabove. All materials, construction, and methods of installation of service equipment shall comply with The Power Company requirements, including, but not limited to: Primary conduits and ductbanks, transformer pads/provisions, concrete equipment pads, metering conduit, grounding system, and instrument transformer cabinets. Service equipment shall be grounded per the National Electrical Code (NEC) and as indicated on the Drawings and in the Specifications.
- D. Utility Service Equipment: Service for the building will be available from a pad mounted transformer by The Power Company. Service metering shall be installed [n the transformer secondary compartment.

1.03 SUBMITTALS:

- A. Shop Drawings submittals shall include, but not be limited to, the following:
 - 1. Dimensioned drawing showing exact provisions for service.
 - 2. Additional information as required in Section 26 00 01, "Electrical General Provisions".

PART 2 PRODUCTS

2.01 GENERAL:

- A. Service Data: The Power Company service data is accurate as determined on the date of Specification issue and shall be verified as described in Paragraph 1.02, hereinabove.

2.02 PRIMARY SERVICE:

- A. General: Division 26 shall provide primary service ductbank and manholes as shown and as specified in Section 26 05 33, "Electrical Raceways", and Section 26 05 34, "Electrical Boxes".
- B. Power Company: The Power Company shall provide primary cables, splices, terminations, and primary overhead service lines.
- C. Approval: The Power Company shall approve the underground primary conduit installation prior to concrete encasement.

2.03 TRANSFORMERS AND SWITCHGEAR:

- A. General: Division 26 shall provide all necessary provisions for service as required by The Power Company, including, but not limited to, grounding rods, grounding conductors, and sleeves.
- D. Power Company: The Power Company shall provide pad mounted transformers, primary switchgear, protective relaying and connections to the customer service cables.

2.04 SECONDARY SERVICE CABLE:

- A. General: Division 26 shall provide secondary service cables as shown for connection to the service transformer.

2.05 METERING EQUIPMENT AND PROVISIONS:

- A. General: Division 26 shall provide metering conduits and metering provisions as shown and as directed by The Power Company.
- E. Power Company: The Power Company shall provide metering equipment, metering cans and interconnecting wiring.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. Standards: The complete installation of the service entrance provisions shall comply with the standards and requirements of The Power Company and with requirements of other Sections of this Division.
- B. Correction: Any failure to meet these standards and requirements shall be corrected to the satisfaction of The Power Company without any additional cost to the Owner.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide wiring device work as shown, scheduled, indicated, and as specified.
- B. Types: The types of wiring devices required for the project include, but are not limited to, the following:
1. Receptacles.
 2. Switches.
 3. Wallbox dimmers.
 4. Pushbuttons.
 5. Wall plates.
 6. Power poles.
 7. Cord reels.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. NEMA WE 1 General-purpose wiring devices.
 2. NEMA WD 5 Specific-purpose wiring devices.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
1. Bryant.
 2. Harvey Hubbell, Inc.
 3. Intermatic.
 4. Leviton.
 5. Lightolier, Inc.
 6. Lutron, Inc.
 7. Pass and Seymour, Inc.
 8. Prescolite.
 9. Raco.
 10. Taymac Corporation.
 11. Wiremold Company.
- B. UL Label: All wiring devices shall be UL-labeled.

1.05 SUBMITTALS:

- A. Shop Drawings submittals shall include, but not be limited to, the following:
1. Cut sheets of the receptacles, switches, wall box dimmers, and pushbuttons.
 2. Cut sheets of the wall plates.
 3. Cut sheets of power poles and cord reels.
 4. Samples of general use receptacle, switch and coverplate types and colors proposed for the project.
 5. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver wiring devices individually wrapped in factory-fabricated containers.
- B. Handle wiring devices carefully to avoid damage, breaking, and scoring.
- C. Store in a clean dry space and protect from the weather.

PART 2 PRODUCTS

2.01 WIRING DEVICES:

- A. General: Provide factory-fabricated wiring devices in the type, color, and electrical rating for the service indicated. Where type and grade are not indicated, provide proper selection to correspond with branch circuit wiring and overcurrent protection. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.

- B. Receptacles: Comply with NEMA Standard WD1 and as follows:

- 1. General Duty Standard: Provide simplex or duplex commercial specification grade standard type receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, with metal mounting straps, back and side wired with screw type terminals, molded high impact thermoplastic compound, NEMA configuration as indicated.

- a. 20 amp, 125 volt grounded simplex NEMA #5-20R Pass & Seymour #5361-*. Leviton #5891-*.
- b. 15 amp, 125 volt grounded duplex NEMA #5-15R Pass & Seymour #5252-*. Leviton #BR15-*.
- c. 20 amp, 125 volt grounded duplex NEMA #5-20R Pass & Seymour #5352-*. Leviton #BR20-*.
- d. 20 amp, 125 volt, Class A, GFCI duplex receptacle with integral ground fault current interrupter, back and side wired with indicator light. Pass & Seymour #2095*L. Leviton #8898-*.
- e. 20 amp, 125 volt, Class A, GFCI duplex receptacle with integral ground fault current interrupter, back and side wired with indicator light hospital grade. Pass & Seymour #2094HG*L. Leviton #8898HG-*.

* Color designation, refer to Paragraph 2.3.

Wiring devices connected to emergency power circuits shall be as specified hereinabove except that wiring devices shall be red in color with coverplates color-matching other devices in the room.

- 2. Heavy-duty Simplex: Provide single heavy-duty type receptacles, with green hexagonal equipment ground screw, with metal mounting straps, back wiring, black molded phenolic compound, NEMA configuration as indicated.
 - a. 30 amp, 125 volt grounded single NEMA #5-30R Hubbell #HBL9308 with #S703 stainless steel wall plate.
 - b. 30 amp, 250 volt, grounded, 3-wire, 2-pole NEMA #6-30R Hubbell #HBL9330 with #S703 stainless steel wall plate.
 - c. 20 amp, 125/250 volt, grounded, 4-wire, 3-pole NEMA #14-20R Hubbell #HBL8410 with #S7 stainless steel wall plate.
 - d. 30 amp, 125/250 volt, grounded, 4-wire, 3-pole NEMA #14-30R Hubbell #HBL9430A with #S701 stainless steel wall plate.

- e. 30 amp, 125/250 volt, grounded, locking, cast
4 wire, 3-pole NEMA #L14-30R (window
plate.
washing receptacle) Hubbell #HBL2710 with #7420
aluminum weatherproof wall
- f. 15 amp, 125 volt, grounded single NEMA
#5-15R Pass & Seymour #S3713-I.
Leviton #688-I
- 3. Specific-use receptacles shall have volts, amps, poles, and NEMA configuration as noted
on Drawings.

2.02 WIRING DEVICE ACCESSORIES:

- A. Wall Plates: Provide duplex outlet plates. Wall plates shall possess the following additional
construction features:
 - 1. Material and Finish:
 - a. Specification grade, Type 302, satin-finished stainless steel, 0.1" thick for heavy duty
receptacles and kitchen receptacles.
 - b. Specification grade, weatherproof, coverplate, gasketed UV stabilized polycarbonate
with hinged gasketed device cover, for exterior and wet area receptacles.
Coverplates shall be NEMA 3R rated and shall be watertight when in use.
Coverplates shall be of a tamper resistant design with a key lock.

PART 3 EXECUTION

3.01 INSPECTION:

- A. Installer must examine the areas and conditions under which wiring devices and floor boxes are
to be installed and notify the Contractor in writing of conditions detrimental to the proper and
timely completion of the work. Inspect devices for physical damage. Do not proceed with the
work until unsatisfactory conditions have been corrected.
- B. Box Condition: Install receptacles and switches only in electrical boxes which are clean, free
from excess building materials, debris, and similar matter.
- C. Receptacles: Install receptacles vertically at a height as specified in Section 26 05 01,
"Electrical Basic Materials and Methods", to receptacle center line above finished floor and
horizontally at a height as specified in Section 26 05 01, "Electrical Basic Materials and
Methods", to receptacle center line above counter tops unless shown or specified otherwise.
Where splash backs occur above counters, mount devices horizontally at a height as specified
in Section 26 05 01, "Electrical Basic Materials and Methods", to receptacle center line above
splash backs. Receptacles shall be installed with ground pin receiver down. All devices shall
be installed complete with coverplates. Use 20 ampere receptacle when only one receptacle is
installed on a branch circuit.[add where hospital grade receptacle are to be installed]

3.02 TESTING:

- A. General: Prior to energization, check for continuity of circuits, for short circuits and check
grounding connections. After energization, check wiring devices to demonstrate proper
operation and receptacle polarization.

END OF SECTION 26 27 26
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SECTION 26 32 13

STANDBY GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide standby engine-driven generator set work as shown, scheduled, indicated, and as specified.
- B. Type: The type of standby engine-driven generator set required for the project include, but are not limited to, natural gas engine-driven generator sets.

1.3 STANDARDS:

- A. Equipment shall comply with applicable sections of the latest edition of the following standards:
 - 1. NEC.
 - 2. NFPA 37 and NFPA 110.
 - 3. IEEE.
 - 4. NEMA.
 - 5. ANSI.
 - 6. TCEQ Requirements (EPA Tier Levels for Non-Road Engines) Latest effective requirements.

1.4 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
 - 1. Caterpillar Tractor Company.
 - 2. Cummins Power Generation/Onan Corporation.
 - 3. MTU Detroit Diesel.
- B. NEC and NFPA Compliance: Comply with applicable portions of the NEC (NFPA 70) including, but not limited to, emergency and standby power generation systems and with NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines", and NFPA 110, "Emergency and Standby Power Systems".
- C. IEEE Compliance: Comply with applicable Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards pertaining to generator construction.

- D. Emissions Compliance: The generator set engine shall comply with all applicable Texas Commission on Environmental Quality (TCEQ) Regulations and Requirements for Houston-Galveston and shall comply with all applicable EPA Tier Levels for Non-Road Engines that is currently in effect for the Houston-Galveston area.
- E. Testing:
1. The entire generator system shall be assembled on the factory test bed and shall be submitted to the full factory standard test to demonstrate automatic operation, start time, full capacity acceptance, regulation, motor starting capability and function of all system safeties, prior to shipping to the job site. System shall be tested at 0.8 pf. A strip chart recording shall be made of each unit to verify frequency, voltage transient, and output power.
 2. The reporting form for the factory test shall be submitted to the Engineer for review with the Shop Drawings submittal and the Engineer shall be notified a minimum of one month prior to the factory test so that an Owner's Representative can witness the test.
- F. Performance Tests: The performance tests of the generating set series shall be in accordance with procedures certified by an independent testing laboratory. The manufacturer shall have successfully tested a prototype of the generating set series offered which shall include:
1. Maximum power level.
 2. Maximum motor starting capacity.
 3. Structural soundness.
 4. Torsigraph analysis per MIL-STD-705B, Method 504.2.
 5. Fuel consumption.
 6. Engine-alternator cooling airflow.
 7. Transient response and steady state governing.
 8. Alternator temperature rise per NEMA MG1-22.40.
 9. Single step load pickup per NFPA 76A-822.
 10. Harmonic analysis and voltage waveform deviation per MIL-STD-705B, Method 601.4.
 11. Three-phase short circuit test for mechanical and electrical strength.
- G. Manufacturer: The system shall be built, tested, and shipped by the manufacturer of the Standby Electric Power System, who has been engaged in the production of engine-alternator sets and associated controls for a minimum of 10 years, so there is one source of supply and responsibility.
- H. Warranty: All equipment bearing a manufacturer's guarantee, such as electrical equipment, devices, components, and similar items, shall be construed to have a 5 year parts, travel, and labor guarantee to the Owner by the manufacturer. Any such equipment that proves defective in materials or workmanship within the guarantee period is to be replaced by the Contractor in accordance with the manufacturer's guarantee.

1.5 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
1. A written description of the system operation (written in this specification format) with all exceptions and/or deviations clearly highlighted or identified.
 2. Completely identified and marked catalog cuts of all associated equipment and devices, with all non-applicable items crossed out, and applicable equipment or devices clearly highlighted or identified.
 3. A written description of the maximum "starting" and "running" kVAs and kW of the system equipment (charts and graphs will not be acceptable).
 4. A floor plan sketch complete with a dimensional description of the standby electric power system and associated equipment, locating the system equipment and accessories within the allotted space.
 5. Interconnection wiring diagrams to indicate terminal connections between the remote alarm annunciator panel and the electric set.
 6. Complete bill of material for all equipment.
 7. Complete warranty information as specified.
 8. A notarized letter from the system supplier certifying compliance with all requirements of this Specification.
 9. Performance test as specified in Paragraph 1.4/E and F of this Section.
 10. Additional information as required in Section 26 00 01.

1.6 STORAGE AND HANDLING:

- A. The standby generator set(s) shall be stored at the factory until they must be shipped to the job site to prevent building construction delay.
- B. The standby generator set(s) shall be crated and covered to protect it from damage during shipment and subsequent storage at the job site.

PART 2 - PRODUCTS

2.1 ENGINE-GENERATOR SETS:

- A. General: Provide a new outdoor rated natural gas engine-driven generator set, complete with safety devices, main output breaker, weatherproof enclosure and vibration isolators. Installation shall be complete with all necessary fuel connections, natural gas fuel system with secondary gas pressure regulator, radiator cooling and engine exhaust from the building. Natural gas piping is specified under Division 22. Unit shall be capable of continuous standby service.
- B. Design Basis: The standby generator set(s) specified and shown on the Drawings is based on a Cummins C300N6 generator and selected from data derived from manufacturer's engineering manuals.
- C. System Capacity: The engine-generator set, as a unit, shall be rated for a continuous standby capacity of 300 kW and 375 kVA at 0.8-PF, with an output of 450 amperes while generating 480Y/277 volt, 3-phase, 4-wire, 60 Hz power, and with performance as specified herein.

1. The engine generator set short circuit current response shall be adequate for first cycle tripping of circuit breakers and clearing of fuses, and the motor generator set shall be capable of developing 300 kW and 1210 kVA for motor starting with a maximum voltage dip of 30% and while complying with the performance requirements specified herein.
 2. A permanent magnet generator (PMG) or equal shall provide excitation power to the automatic voltage regulator for immunity from voltage distortion caused by nonlinear SCR controlled loads on the generator. The PMG shall sustain main field excitation power for optimum motor starting and to sustain short circuit current for selective operation and coordination of system overcurrent devices.
- D. Natural Gas Engine: Engine shall be an 8, 12, or 16 cylinder, 4 cycle, turbocharged/aftercooled or normally aspirated natural gas engine, water-cooled with mounted water pump. Following items shall be included:
1. Valves: Intake and exhaust valves shall be heat-resisting alloy steel, free rotating. Exhaust valve seat inserts shall be replaceable.
 2. Battery Charging: Belt-driven engine alternator; 24 volt negative ground 35 amp dc, with transistorized voltage regulator.
 3. Governor: Electronic speed-sensing governor capable of isochronous frequency regulation from no load to full rated load. Speed droop shall be externally adjustable from isochronous to 5%.
 4. Filters: Air cleaner and lube oil filters shall have replaceable elements.
 5. Starting System: Remote 24 volt, 2-wire, negative ground, starting system, positive shift, gear engaging electric starter, cranking limiter.
 6. Lubrication System: Forced feed gear design lube oil pump; full pressure lubrication to all bearings; dual, full flow oil filters; oil level indicator; low oil pressure shutdown; lube oil cooler; and oil pressure gauge.
 7. Natural Gas Fuel System: Dry natural gas having a LHV of 905 BTU/CF at a delivery pressure of 5 psi. Engine shall have a natural gas carburetor and gas train with a secondary gas pressure regulator. Average fuel consumption at full load shall not exceed 4098 CFH.
 8. Cooling System: The cooling system shall be unit mounted radiator cooled, self-sealing prelubricated coolant pump; belt driven pusher fan with wire guard; thermostat temperature control; high coolant temperature shutdown; low coolant level shutdown; intercooler. The cooling system shall be tested for leaks. As soon as the system has been tested, it shall be filled with ethylene glycol rust inhibiting and antifreeze solution sufficient to protect the system to -10°F. Engine-driven pusher type cooling fan shall be sized to maintain safe operation at 122°F maximum ambient temperature. Airflow restriction from static pressure at the radiator discharge shall not be more than 0.5" of water.
 9. Emissions Compliance: The generator set engine shall comply with all applicable Texas Commission on Environmental Quality (TCEQ) Regulations and Requirements for Houston-Galveston and shall comply with all applicable EPA Tier Levels for Non-Road Engines that is currently in effect for the Houston-Galveston area at the time of installation.

- E. Set Characteristics: Set manufacturer shall certify that reserve horsepower is available from the engine with all accessories operating in the ambient conditions hereinbelow. The diesel engine-generator set shall be capable of picking up 100% of nameplate kW and power factor, less applicable derating factors, in one step with the engine-generator set at operating temperature, in accordance with NFPA 110, Paragraph 5.13.2.6, and including the following constraints:
1. Ambient conditions of 50' altitude and an ambient temperature of -10 to 122°F.
 2. The BMEP of a turbocharged engine producing rated generator capacity shall not exceed 306 psi for four cycle engines and 225 psi for two cycle engines.
 3. The rpm of the engine shall not exceed 1800 rpm and the engine piston speed shall not exceed 2000'per minute.
- F. Engine Protective Devices:
1. The engine protective devices shall provide automatic shutdown for overcrank, overspeed, high coolant temperature and low oil pressure. A low coolant level protective device shall be provided but shall alarm only and not initiate engine shutdown
 2. The high coolant temperature and low oil pressure shall have pre-shutdown signals.
 3. The overcrank alarm shall be the output of a solid-state cranking device preset at a 10 second cranking cycle and a 15 second rest cycle. If the engine fails to start on the third cranking cycle, the overcrank alarm shall sound and cranking shall stop. Unit shall be capable of repeating the above cranking cycle after the trouble has been cleared.
- G. Generator: Generator shall be 4-pole, revolving field type, brushless, dynamically balanced, skewed laminated, two thirds pitch wound, rotating rectifier exciter, temperature compensated solid-state voltage regulator, open dripproof, single bearing, permanently aligned generator connected to engine with flexible disc coupling, including the following:
1. NEMA Class F or better insulation as defined by NEMA MG1.65.
 2. Temperature rise at rated load within NEMA MG1-22.40 definition.
 3. Double-sealed ball bearings, lubricated for life.
 4. Direct-drive centrifugal blower cooling.
 5. A 120 volt, single phase space heater shall be provided to prevent condensation in the generator.
 6. AC output leads shall be brought out to field connection busbars accessible through removable plates in the generator output junction box.
 7. The automatic voltage regulator shall be a solid state design and include overvoltage and undervoltage protection functions. The voltage regulator shall be equipped with 3-phase RMS sensing. The regulator shall control buildup of ac generator voltage to provide a linear rise and limit overshoot. Overvoltage protection shall sense the ac generator output voltage and in the event of regulator failure or loss of reference, shutdown regulator output on a sustained overvoltage of one second duration. Over excitation protection shall sense regulator output and shutdown regulator output if overloads exceed 10 seconds duration. Both overvoltage and over excitation protection shutdowns shall be latched, requiring generator set shutdown to reset.

8. The regulator shall include an under-frequency roll-off torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 Hz. The torque-matching characteristic shall include differential rate of frequency change compensation to use maximum available engine torque and provide optimal transient load response. Regulators which use fixed volts per Hertz characteristics are not acceptable.
- H. Generator Output Circuit Breaker(s): Generator set shall have 3 pole output circuit breaker(s) with solid state trip units as shown on the drawings. Breaker frame and trip ratings shall be as shown on the drawings. Breakers serving emergency and standby loads shall have breaker position indicating contacts. Breaker position indicating contacts shall be wired to initiate a generator control panel alarm when the breaker is open or tripped. Circuit breaker manufacturer and type for all breakers serving emergency and standby loads shall match the project electrical gear package to provide compatibility for selective coordination required by the NEC.
- I. Engine/Generator Set Performance:
1. Frequency Regulation: Isochronous from no load to full rated load.
 2. Voltage Regulation: Plus 2% no load to rated load; rheostat for _5% voltage adjustment.
 3. Voltage Dip: Instantaneous voltage dip shall be less than 15% of rated voltage when full, 3-phase load and rated power factor is applied to the generator. Recovery to stable operation shall occur within 5 seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant with _1% of rated voltage. All unit performance characteristics shall be verified using an oscilloscope.
 4. Total Harmonic Distortion (THD): The sum of ac voltage waveform harmonics, from no load to full linear load shall not exceed 5% of the rated voltage (L-N, LL, L-L-L) and no single harmonic shall exceed 3% of rated voltage. Telephone Influence Factor (TIF) shall be less than 50 per NEMA MG1-22.43. Temperature rise at rated load and power factor shall be within NEMA MG1-22.40 definition.
 5. Voltage Dip Performance: A light beam oscilloscope test for the specific generator set, by model and serial number shall be provided for the steps loads listed hereinbelow. Certified test results shall be reported via a strip chart recorder and submitted with generator factory test results.
 - a. 0% to 25% kW load at 0.4 lagging PF.
 - b. 0% to 50% kW load at 0.4 lagging PF.
 - c. 0% to 75% kW load at 0.4 lagging PF.
 - d. 0% to 100% kW load at 0.4 lagging PF.
- J. Engine-Generator Instrument Panel: The instrument panel shall be mounted on vibration isolators and shall have dc controls, ac controls, and panel lighting. The top of the instrument panel shall not be more than 6'-6" above finished floor.
1. DC engine controls (2-wire, 24 volt system) including but are not limited to run-stop-automatic test-manual switch, remote start-stop terminals, oil pressure gauge, coolant temperature gauge, charge rate ammeter and running time hour meter.

2. Solid state engine monitoring system with monitors in accordance with NEC Section 700, NFPA 110 and local code requirements with lamps, audible alarm, lamp test switch, individual alarm contacts and a common alarm contact for:
 - a. Overcrank shutdown
 - b. Low coolant temperature warning
 - c. Pre-warning for high engine temperature
 - d. High engine temperature shutdown
 - e. Pre-warning for low lube oil pressure
 - f. Low lube oil pressure shutdown
 - g. Overspeed shutdown
 - h. Low coolant level warning
 - i. Generator (EPS) supplying load.
 - j. Generator control switch not in auto position warning
 - k. High battery voltage warning
 - l. Low cranking voltage warning
 - m. Low battery voltage warning
 - n. Battery charger failure
 - o. Generator output breaker(s) open warning
 - p. Customer alarm
 - q. Customer alarm
 - r. Customer alarm
3. Provide two dry auxiliary contacts one for common alarm and one for engine running to be monitored by the BAS.
4. AC output controls include, but are not limited to, an ac voltmeter; ac ammeter; voltmeter-ammeter phase selector with an "off" position; voltage adjusting rheostat; frequency meter; manual reset exciter circuit breaker and fine speed control potentiometer.
5. Two sets of double pole auxiliary contacts shall change state when engine starts; one set shall be monitored by the BAS and on set is spare.

K. Accessories:

1. Remote Annunciator(s): Flush mounted remote annunciators shall be microprocessor based annunciator with network communication type, located as shown on the Drawings, and shall have audible and LED visual signal devices, powered by the electric set lead acid battery set, to provide a warning of derangement or alarm conditions in the electric set in compliance with the National Electrical Code Section 700, NFPA 110 level 1, 20 lamp and the requirements of these Specifications. The enclosure shall be constructed of sturdy sheet steel with white finish, and shall have removable front panel and adapter ring for flush mounting. The face of the front panel shall contain LED's (visual signals),

and audible alarm, an alarm silence push button, and a LED test push button. The internal wiring, terminal block, and battery voltage sensors shall be accessible by removing the front panel of the enclosure. Remote annunciators shall indicate the following conditions:

- a. Visible and audible alarm for:
 - 1) Overcrank shutdown
 - 2) Low coolant temperature warning
 - 3) Pre-warning for high engine temperature
 - 4) High engine temperature shutdown
 - 5) Low lube oil pressure shutdown
 - 6) Overspeed shutdown
 - 7) Low coolant level warning
 - 8) Generator control switch not in auto position warning
 - 9) Low cranking voltage warning
 - 10) Low battery voltage warning
 - 11) Generator output breaker(s) open warning
 - 12) Generator power available
 - 13) Spare/Customer alarm
 - 14) Spare/Customer alarm
 - 15) Spare/Customer alarm
 - 16) Spare/Customer alarm
 - 17) Spare/Customer alarm
 - 18) Spare/Customer alarm
 - 19) Spare/Customer alarm
- b. Visible indicator for:
 - 1) Battery voltage okay.
2. Jacket-Water Heater: The engine shall have one KIM #Hotstart (480 volt, 1-phase) or approved equal, 5000W jacket-water heater supplied from a "normal" branch circuit. The jacket-water heater shall be complete with a thermostat capable of maintaining a water temperature of 25°C, with an ambient temperature of 0°C. A water temperature alarm, consisting of a contact closed when the jacket water temperature is below 20°C, shall be supplied.
3. Exhaust System: Exhaust silencer(s) of the "critical" type, with side or end inlet as required shall be shipped pre-installed and piped on top of the generator enclosure. The exhaust silencer(s) shall be of chambered construction and shall provide maximum degree silencing, and shall be sized to assure proper operation without excessive back pressure when installed in the exhaust system. The exhaust silencer(s) shall be

supplied with condensation drains, flexible exhaust tubing, wall thimbles and rain caps, as required.

4. Starting Batteries: Furnish and install fully charged 24 volt lead acid, impact resistant, storage batteries mounted on the unit or on a separate rack. Batteries shall have sufficient capacity for 60 seconds of continuous cranking per NFPA 99. Provide all required battery cables, connections, electrolyte and a battery hydrometer.
5. Solid-State Battery Float Charger: A suitable 120 volt automatic SCR voltage regulated battery charger with a maximum charge rate, as recommended by the manufacturer, but not less than 10 amperes shall be provided to maintain each set of batteries at full capacity during standby conditions. The maximum charging time to bring the batteries up to full charge shall not exceed 12 hours. The charger shall be provided with a remote alarm contact to indicate a charger failure condition. An ammeter shall indicate the charge rate and the circuit shall be protected by either fuses or circuit breakers. The charger shall be so designed that it will not be damaged during the engine cranking and shall be interlocked such that it is not damaged during generator set operation. The charger may be furnished as a separate item with necessary cables and leads.
6. Natural Gas Regulator/Piping: Each generator set shall be provided with a natural gas regulator sized to serve the generator set from a 5 psig natural gas supply and factory piped to the engine carburetor.
7. Vibration Isolation: Suitable aluminum housed, spring type vibration isolators be provided. Isolators shall be sized to properly support the generator set and to isolate 99% of the generators vibration from the supporting structure.
8. Skid Base: The entire packaged unit shall be mounted on a skid base of welded structural steel, of box type construction suitable for mounting on spring vibration isolators. A sloped drip pan shall be provided for containing engine fluid spills. Provisions for stub up of electrical and fuel connections shall be within the footprint of the generator set base rails.
9. Painting: The entire engine generator set shall have all exposed metal surfaces primed with a rust inhibiting primer and multiple finish coats of the manufacturer's standard machinery enamel finish.
10. Generator Outdoor Housing: Provide a weatherproof and rodent-proof outdoor shelter to entirely enclose each generator set, including batteries. Silencers shall be installed inside enclosure. Enclosure shall have a fixed intake louver with bird screen and a grill protected radiator discharge opening. Enclosure shall have hinges and gasketed access doors and access panels to allow complete unit operation and maintenance without removal of the enclosure. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted in the manufacturer's standard color.

PART 3 - EXECUTION

3.1 INSTALLATION OF ENGINE-DRIVEN GENERATOR SETS:

- A. General: Install standby engine-driven generator sets where shown, in accordance with the equipment manufacturer's written instructions and recognized industry practices, to ensure that the sets comply with the specified requirements and serve the intended purposes.

- B. Standards: Comply with NEMA standards, requirements of the NEC and applicable portions of NECA's "Standard of Installation" pertaining to installation of standby engine-driven generator sets and accessories.
- C. Vibration Mounts: Install units on properly sized spring type vibration mounts and ribbed neoprene vibration isolators; comply with manufacturer's indicated installation method as applicable.
- D. Concrete Pad: Install generator set on a 6" reinforced concrete pad. The generator pad shall extend 6" beyond the generator set base, unless shown otherwise. Furnish the exact position of any block-outs, mounting bolts, and the dimensions and location of the generator pad in a timely manner so as to prevent delay of the concrete work. Refer to Section 26 05 01, "Basic Materials and Methods", for additional requirements.

3.2 GROUNDING:

- A. General: Install the generator(s) as a separately derived system. Ground the generator neutral to the generator frame and bond to the building ground loop. Refer to Section 26 05 26, "Grounding and Bonding for Electrical Systems", for additional requirements.

3.3 CONTROL WIRING:

- A. General: Provide generator start-up control wiring from each automatic transfer switch to each standby generator set.
- B. Annunciators: Provide control wiring to remote generator annunciators in locations specified and as shown on the Drawings.

3.4 COORDINATION:

- A. Natural Gas Piping: Natural gas piping shall be furnished and installed under Division 22.

3.5 INITIAL START-UP AND SYSTEM CHECKOUT:

- A. A complete installation shall be initially inspected, adjusted and started and checked out for operational compliance by representatives of the manufacturer.
- B. The engine lubrication oil and antifreeze shall be provided by the supplier of the electric set for operation under environmental conditions as recommended by the manufacturer.

3.6 TESTING:

- A. General: Upon completion of installation of engine-driven generator set(s), transfer switches and after building circuitry has been energized with normal power source, test emergency power system to demonstrate standby capability and compliance with specified requirements, including automatic start-up, controls, and full load acceptance. Tests shall include operation of standby power system with voltage check while the system is loaded to ensure proper operation of the emergency generator, transfer switches, natural gas supply and other system components. Operation of the system shall simulate standby power conditions, that is, loss of main electrical power to the building. Test period shall be a minimum of 2 hours continuous trouble-free operation with at least four automatic transfer switch operations for each switch within the period of operation.
- B. Test Load: Testing shall be performed at 0.8 PF with loads as specified hereinbelow. Where the specific set has been factory tested at 0.8 PF as specified hereinbelow, field-testing may be performed at 1.0 PF. The supplier of the engine-generator set shall provide a load bank of

sufficient capacity to complement the available building load for testing. The field test shall include running the emergency power system under loads as specified below:

1. 30 minutes at 25% of rated load (field load bank).
2. 15 minutes at 50% of rated load (field load bank).
3. 15 minutes at 75% of rated load (field load bank).
4. 30 minutes at 100% of rated load (field load bank).
5. Miscellaneous building loads may be used to supplement load bank.

- C. Test Readings: The voltage current and frequency readings shall be recorded at 15 minute intervals throughout the test. Each automatic transfer switch shall automatically operate a minimum of four times during the test. There shall be a 15 minute unloaded run at the conclusion of the test to allow engine to cool before shutdown. The Contractor shall make all necessary hook-ups to facilitate field-test and shall furnish all fuel necessary for field-testing. Refer to Section 26 01 25, "Electrical Testing", for additional testing requirements.
- D. Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit four copies of certified test results to Architect for review. Test reports shall include date and time of test, relative humidity, temperature, and weather conditions.

3.7 OPERATOR TRAINING:

- A. The manufacturer's start-up representative shall provide a minimum of 2 hours of operating and maintenance training to the Owner's maintenance personnel. Training shall be provided at times convenient to the Owner. Approved Operating and Maintenance Manuals shall be available to the Owner prior to the training session.
- B. Instructions and Drawings: Complete instructions, consisting of operating and maintenance manuals, parts book, dimensional drawings, separate unit wiring diagrams and schematics and interconnecting wiring diagrams shall be provided as part of the project operating and maintenance manuals.

3.8 IDENTIFICATION:

- A. General: Refer to Section 26 05 53, "Identification for Electrical Systems", for requirements concerning painting, nameplates, and labeling.

END OF SECTION 26 32 13

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SECTION 26 36 34

AUTOMATIC TRANSFER/BYPASS-ISOLATION SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide automatic transfer and bypass-isolation switch work as shown, scheduled, indicated, and as specified.

1.3 STANDARDS:

- A. Equipment shall comply with the following standards:
 - 1. UL 1008.
 - 2. NEC.
 - 3. NFPA 110 - Standard for Emergency and Standby Power Systems.
 - 4. NFPA 101 - Life Safety Code.
 - 5. ANSI/IEEE C37.90a - Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.
 - 6. NEMA Standard ICS-109.21 - Impulse Withstand Test.

1.4 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
 - 1. Automatic Switch Company.
 - 2. Cummins Power Generation/Onan.
 - 3. Russelectric, Inc.
 - 4. Zenith Controls, Inc.
- B. NEC and NFPA Compliance: Comply with applicable portions of the NEC (NFPA 70) including, but not limited to, emergency and standby power system.
- C. Standards: The automatic transfer switches shall conform to the requirements of NEMA Standard ICS 2-447 and Underwriters' Laboratories UL-1008 and shall be UL-listed as follows:
 - 1. For use in emergency and stand-by systems in accordance with Articles 517, 700, 701 and 702 of the National Electric Code.

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2. Rated in amperes for total system transfer including control of motors, electric discharge lamps, electric heating, and tungsten filament lamp loads as referred to in Paragraph 1.7 and 1.9 of UL-1008.

D. Factory-testing: All production units shall be subjected to the following factory tests:

1. The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
2. Each switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.21.
3. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472-1974 (ANSI C37.90a) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.

E. Performance Tests: Certified independent laboratory test data on a switch of the same design and rating shall be provided to confirm the following switching abilities:

1. Overload and endurance at 480 volts ac per Tables 25.1, 25.2, 27.1 and 27.2 of UL-1008 when enclosed according to NEMA Standard ICS 2-447 and UL 1008.
2. Temperature rise tests after the overload and endurance tests to confirm the ability of the transfer switches to carry their rated current within the allowable temperature limits of the insulation in contact with current carrying parts.
3. Withstand current tests per Paragraph 31 of UL-1008 for 200,000 amperes rms symmetrical when protected by fuses and at fault currents per UL-1008 (dated July 6, 2012) when protected by circuit breakers, at 480 volts and X/R ratio of 6.6.
4. No welding of contacts. Transfer switch must be operable to alternate source after the withstand current tests.
5. Dielectric tests at 1960 volts, RMS, minimum after the withstand current test.

F. Warranty: The automatic transfer switches shall be warranted for a period of 5 years from the date of Substantial Completion.

1.5 SUBMITTALS:

A. Shop Drawing submittals shall include, but not be limited to, the following:

1. Completely identified and marked catalog cuts of automatic transfer and bypass-isolation switches all associated equipment and devices, with all nonapplicable items crossed out, and applicable equipment or devices clearly highlighted or identified.
2. Interconnecting wiring diagrams to indicate all external interlock control wiring terminal connections.
3. Complete bill of material for all equipment.
4. Complete warranty information as specified.
5. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.6 STORAGE AND HANDLING:

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- A. Deliver automatic transfer and bypass-isolation switches in factory-fabricated water-resistant wrapping.
- B. Handle transfer and bypass-isolation switches carefully to avoid damage to material component, enclosure, and finish.
- C. Store transfer and bypass-isolation switches in a clean, dry space and protect from weather.

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCHES:

- A. General:
 - 1. Provide automatic transfer and bypass-isolation switches with number of poles, voltage and full load current rating as shown or required. The neutral, where present shall be switched using a four pole transfer switch with a full size neutral pole. Transfer switches shall be UL-listed per applicable UL standards as a recognized component for emergency systems and rated for all classes of loads. Sizes rated below 400 amperes shall also be rated for 100% tungsten lamp loads.
 - 2. Automatic transfer and bypass-isolation switches shall be product of a quality manufacturer regularly engaged in the design, development and manufacture of solid-state electromagnetic switching devices with adequate testing facilities and a recognized quality control program to ensure product output reliability, performance and safety.
 - 3. Automatic transfer and bypass-isolation switches (ATS/BI) shall form a complete grounded, continuous-duty, integral assembly which is metal enclosed, dead front, and suitable for the voltage, amperage, load starting characteristics and environment where the switches shall be installed.
 - 4. The manufacturer of the ATS/BI units shall furnish switches complete and ready to operate with only the wiring connections to field devices left upon installation of the ATS.
 - 5. Each ATS/BI shall have been factory-tested for correct and proper operation as outlined in these Specifications.
- B. Construction:
 - 1. The transfer switch shall be electrically operated by a single nonfused solenoid or motor operator, momentarily energized from the source to which the load is to be transferred. The complete time of transfer, measured from the instant the operator is energized until the main contacts close on the alternate source, shall not exceed 1/3 of a second.
 - 2. The transfer switch shall be mechanically locked in each direction without depending upon gravity, gear mechanisms, latches, or hooks. Release of the locking mechanism shall be possible only by normal operation of the electrical operator.
 - 3. Main contact travel shall be smooth and continuous, with no momentary pause or delay, throughout the transfer operation. There shall be no possibility of a neutral position or for both sides to be closed simultaneously. An overload or short circuit shall not cause the switch to go to a neutral position.
 - 4. Main contacts shall be silver alloy, wiping action type, protected by arc barriers with separate arcing contacts on all sizes. Blow-on construction, with rigid movable contacts and deflection by the stationary contacts, shall be furnished on all switches rated 400

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amperes and higher. Electrical spacings shall not be less than those specified in Table 3 of UL Standard 1008.

5. Inspection and replacement of stationary and movable main contacts shall be possible from the front of the switch without major disassembly of associated parts, without disconnection of the power conductors or main operator linkages, and without removal of the switch from the enclosure.
6. Main contacts consisting of assemblies or subassemblies, not originally manufactured for transfer switch service, shall be fully identified (name of the original manufacturer, catalog number and original electrical ratings). Any modifications made to the original products shall be described at the time of submittal.
7. Each automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation.
8. Switches shall be rated for continuous duty, shall be inherently double throw and shall be mechanically interlocked to ensure only one of two possible positions: (a) normal or (b) emergency.
9. Automatic transfer switches shall be suitable for use with "emergency" sources such as an engine or turbine driven generator source or another utility source.
10. The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. The interconnecting wiring harness shall include a disconnect plug to disconnect all wires including both sources of control power for routine maintenance.
11. Sensing and control logic shall be solid-state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade plug-in type with dust covers.
12. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.
13. Automatic transfer and bypass-isolation switches utilizing components of molded case circuit breakers, contactors, or parts thereof which have not been intended for continuous duty or repetitive load transfer switching are not acceptable.
14. The automatic transfer and bypass-isolation switches shall be mounted in NEMA 3R non-ventilated wall-mounted or floor-mounted enclosures. Switches and accessory devices shall have number of poles rated as shown on the plans.
15. All metal surfaces, both inside and outside the cabinet, shall be primed and painted with ANSI 61, light gray, enamel-based paint.
16. Doors shall be hinged and lockable.
17. All components of the operating mechanisms and mechanical interlocks shall be insulated or grounded.
18. The electrical ratings of the bypass-isolation switch shall equal or exceed those of the associated automatic transfer switch.

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19. The automatic transfer and bypass-isolation switch shall be the product of one manufacturer and be completely factory interconnected and tested so that only the service and load connections to the bypass switch are required for field installation.
20. All interconnections between the transfer switch, bypass switch and isolation switch shall be by silver-plated copper busbar.
21. A visual position indicator shall be provided to indicate bypass-isolation switch positions, and availability of "normal" and "emergency" sources. A prominent and detailed instruction plate shall be furnished for convenient operation.
22. The automatic transfer and bypass-isolation switch shall provide manual bypass of the load and isolation of all service and load terminals of the automatic transfer switch without interrupting power to the load.
23. The bypass-isolation switch shall be capable of bypassing the load to either source. Load bypass to the automatic transfer switch's connected source shall be affected without load interruption. Provisions shall be made to assure continuity of auxiliary circuits necessary for the proper operation of the system.
24. The isolation handle shall provide three positions: "Closed", "Test", and "Open". The "Test" position shall permit electrical testing of the automatic transfer switch without disturbing the load. The "Open" position shall completely isolate the transfer switch from both lines and load without actual removal of the line or load conductors, and allow its removal for inspection, adjustment and maintenance.
25. While in the "Test" or "Open" positions, the bypass switch shall function as a manual transfer switch to allow load transfer to either source of power regardless of the position or condition of the transfer switch, including the condition when the automatic transfer switch is removed, and without reconnecting the load terminals of the automatic transfer switch.

C. Operation:

1. The automatic transfer switch control panel shall utilize solid-state sensing on "normal" and "emergency" for automatic, positive operation. The following shall be provided:
 - a. Three phase automatic transfer switches - all phases of the "normal" source and of the "emergency" source shall be monitored line-to-line with close differential voltage sensing.
 - b. The "pickup voltage" shall be adjustable from 85% to 100% of nominal.
 - c. The "dropout voltage" shall be adjustable from 75% to 98% of the pickup value.
 - d. The starting of the emergency source stand-by power system will be initiated upon "normal" source failure, or upon reduction of the "normal" source voltage to 80% of normal voltage.
 - e. Independent frequency sensing of the "emergency" source shall be provided.
 - f. The "pickup frequency" shall be adjustable from 90% to 100% of nominal.
 - g. The "transfer-to-emergency" will be initiated when the "emergency" source voltage is 90% or more of nominal voltage, and the frequency of the "emergency" source is 95% or more of nominal.

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- h. The "retransfer-to-normal" shall occur when "normal" source voltage restores to 90% of nominal voltage. Retransfer time delay to NORMAL source shall be adjustable from zero (0) to 30 minutes. Set time delay at 30 minutes. The time delay shall be automatically bypassed if the STANDBY source fails. The ATS shall automatically retransfer to the NORMAL source if the STANDBY source fails and the normal source is available.
 - i. An in-phase monitor relay shall be provided and shall be wired and factory set such that hot source to hot source transfer in either direction is inhibited until the phase angle of both sources is within a 15 degree band. The in-phase monitor shall check for synchronization rather than simply being a time delay transfer.
 - j. Additional auxiliary contacts and interlocks as required for control functions listed in Paragraph 3.2.
2. Time Delay:
- a. A time delay to override momentary "normal" source outages to delay all transfer switch and engine starting signals. The time delay shall be field-adjustable from 0.5 to 6 seconds and factory-set for 4 seconds.
 - b. A time delay on "transfer-to-emergency" for the automatic transfer switch(es) shall be field adjustable from zero (0) to 60 seconds and shall be initially as follows:

ATS #1 0 seconds

Time delays on "transfer-to-emergency" and "retransfer-to-normal" for the Elevator automatic transfer switches shall be field adjustable from zero (0) to 60 seconds and shall be initially set at 30 seconds. Refer to additional requirements for Elevator Automatic Transfer Switches hereinafter specified.
 - c. A time delay on "retransfer-to-normal" source shall be automatically bypassed if the "emergency" source fails and "normal" source is available. The time delay shall be field-adjustable from zero (0) to 30 minutes and factory-set at 30 minutes.
 - d. A time delay for "shut-down" of the emergency generator set to provide unloaded running of the engine for cooldown. The time delay shall be field-adjustable from zero (0) to 10 minutes and field-adjusted for the time setting as recommended by the stand-by generator set manufacturer.
 - e. All time delays shall have an indicator to show the time delay setting including the units of measure used in the setting.
3. Engine Control Contacts: A contact that closes when "normal" source fails for initiating engine starting, rated 10 amps, 32 volts dc. Contacts to be gold plated for low voltage service.
4. Auxiliary Contacts:
- a. Three auxiliary contacts that close when the automatic transfer switch is connected to "normal" source, rated 10 amps, 480 volts, 60 Hz ac. These contacts shall be in addition to those required for ATS/BI indicators, monitoring and control interlock functions.

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- b. Three auxiliary contacts that close when the automatic transfer switch is connected to "emergency" source, rated 10 amps, 480 volts, 60 Hz ac. These contacts shall be in addition to those required for ATS/BI indicators, monitoring and control interlock functions.
 5. Manual Controls:
 - a. A test switch to momentarily simulate normal source failure. Refer to elevator automatic transfer switches for additional requirements.
 6. Indicator Lights:
 - a. Two green indicator lights shall be provided, one to indicate normal source available and one to indicate load connected to normal source.
 - b. Two red indicator lights shall be provided, one to indicate emergency source available and one to indicate load connected to emergency source.
 7. Generator Exercise Timer:
 - a. A clock exerciser shall be furnished (in ATS/BI-1) to automatically start the electric set at regular intervals and allow it to run for a preset time period, minimum of 30 minutes per week. A selector switch shall permit selection of "without load" or "with load" operation. "Without load" the electric set runs unloaded and "with load" the automatic transfer switch transfers the load to the electric set, after appropriate time delays, the same as it would for a normal source interruption.
 - b. Day and time shall be set as directed by the Owner. Time switch shall have battery backup or a spring wound reserve timer.
 8. Remote Transfer Switch Annunciator(s):
 - a. Provide a microprocessor based remote transfer switch annunciator(s) to provide remote status reporting and testing of each transfer switch. The annunciator shall be equal to the Asco No. 2140A400 annunciator and shall communicate with the transfer switches through a RS-422 serial communications network.
- D. Elevator Automatic Transfer Switches: Automatic transfer switches through which elevators are serviced shall function as follows:
1. The emergency power source shall be signaled to start by the transfer switch losing the "normal" power source. The automatic transfer switch controls shall send a separate, adjustable, 30 second nominal presignal to each elevator system served by the ATS. After the presignal delay, sufficient time for elevator back EMF to have dissipated, the automatic transfer switch shall "transfer-to-emergency" power source. Upon failure of the normal source, the pre-signal time delay to emergency shall be bypassed.
 2. Provide auxiliary contacts that which close when the transfer switch is connected to the "emergency" source to signal individually each elevator group controller served by the ATS to initiate single elevator (one-at-a-time) operation.
 3. Upon restoration of the "normal" power source, the automatic transfer switch controls shall send a 30 second presignal to each elevator system served by the ATS. The automatic transfer switch shall then "retransfer-to-normal" source, and all elevators in the group shall then become operational.

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4. Testing system operation with both "normal" and "emergency" sources shall be provided by a test switch and shall have 30 second presignal prior to transfer so that all cars stop at the nearest available floor.

E. Ratings:

1. Withstand Rating: RMS symmetrical fault current per Paragraph 9.9 of UL-1008 (dated July 6, 2012) for transfer switches protected by current-limiting fuses and circuit breakers.
2. Overload Rating: 50 operations, six times rated current, 0.40 to 0.50 power factor.
3. Endurance Rating: Ratings 1 to 1200 amperes; 6000 operations (0.40 to 0.50 power factor, 200% rated current).
4. Mechanical Durability: 100 operations, no-load, at a rate not less than one operation per second.
5. Interrupting Rating: 50 operations, any magnitude of current between 1% and 100% of rated current, 0.40 to 0.50 power factor.
6. Closing Rating: Inrush to 20 times rated current.
7. Thermal Rating: 20 times rated current, one second duration.
8. Temperature Rise: The manufacturer shall have performed tests on similar switches and the above ratings shall be based on using the same contacts for a series of tests without service or replacement of contacts. After testing, the maximum stabilized temperature rise of the main contacts carrying rated load in a non-ventilated enclosure shall not exceed NEMA standards (65° C rise).

F. Spare Parts and Tools:

1. Provide five spare indicating lamps for each ATS/BI.
2. Provide one set of all tools required for normal maintenance at ATS/BI.

PART 3 - EXECUTION

3.1 INSTALLATION OF AUTOMATIC TRANSFER AND BYPASS-ISOLATION SWITCHES:

- A. General: Automatic transfer and bypass-isolation switches shall be installed, including all connections, where and as indicated on Drawings and wiring diagrams as specified herein, and in accordance with approved Shop Drawings and manufacturer's instructions.
- B. Standards: Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's, "Standard for Installation", for transfer switches.
- C. Tightness: Torque bus connections and tighten mechanical fasteners.
- D. Concrete Pad: Install floor-mounted transfer and bypass-isolation switches on a reinforced concrete pad. The ATS/BI pad shall extend 3" beyond the switch enclosure, unless noted otherwise. Switch shall be bolted to the housekeeping pad using 3/8" minimum galvanized bolts and anchors on 30" maximum centers. Furnish the exact location of any blockouts, dimensions, and locations of the housekeeping pads in a timely manner so as to prevent delay of the concrete work. Refer to Section 26 05 01, "Electrical Basic Materials and Methods", for additional requirements.
- E. Adjustment: Adjust operating mechanisms for free mechanical movement.

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- F. Finish: Touch-up scratched or marred surfaces to match original finish.

3.2 CONTROL WIRING:

- A. General: Provide control wiring from each automatic transfer switch to the generator for generator starting and transfer switch control.
- B. Ensure that the generator control wiring complies with NEC 700.10(D)(3). "The integrity of the generator control wiring shall be continuously monitored. Loss of integrity of the remote start circuit(s) shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and the start generator(s).
- C. Elevator Emergency Operation: Provide control wiring as required from automatic transfer switch emergency position indicating and presignal contacts to the emergency operation terminals on each elevator controller served by that transfer switch, for initiating the emergency operating sequence. Control wiring shall be installed in a suitable raceway.
- D. Auxiliary Contacts: One additional N.O. auxiliary contact which closes when ATS is connected to normal power and one additional N.O. auxiliary contact which closes when ATS is connected to standby power. These contacts are for future use and are in addition to any contacts required for control, interlock, or monitoring functions.

3.3 COORDINATION:

- A. Control Wiring: Coordinate control wiring connections and provisions with Division 14 for elevators. This coordination shall be the responsibility of this Division.
- B. Instructions and Drawings: Complete instructions, consisting of operating and maintenance manuals, parts book, dimensional drawings, separate unit wiring diagrams and schematics and interconnecting wiring diagrams shall be provided to the Engineer within 30 days of completion of the project.

3.4 TESTING:

- A. Pre-energization Checks: Prior to energization, check automatic transfer and bypass-isolation switches for continuity of circuits and for short circuits.
- B. General:
 - 1. The complete installation shall be initially operated and checked out for operational compliance by representatives of the manufacturer of the automatic transfer switches.
 - 2. Upon completion of initial start-up and system checkout, the supplier of the automatic transfer switches or his authorized representative shall perform a field test, witnessed by the engineer, to demonstrate full compliance with all requirements of the specification, but not be limited to demonstration of proper operation of all control interlocks, a minimum of four automatic operations of each transfer switch, and full operation of the bypass-isolation switches. This testing shall be performed in conjunction with standby generator system testing.
- C. Reporting: Upon completion of the field test, four copies of the final report shall be documented, certified, and sent to the Engineer for distribution to the Owner or authorized Owner's representative, indicating that all automatic transfer switches in conjunction with the standby electric power system have been tested and are 100% operational.
- D. Thermographic Testing: Refer to Section 26 01 25, "Electrical Testing", for thermographic testing.

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3.5 OPERATOR TRAINING:

- A. The manufacturer's startup representative shall provide a minimum of 8 hours of operating and maintenance training to the Owner's maintenance personnel. Training shall be provided at times convenient to the Owner. Approved Operating and Maintenance Manuals shall be available to the Owner prior to the training session.

3.6 IDENTIFICATION:

- A. General: Refer to Section 26 05 53, "Identification for Electrical Systems", for applicable painting, nameplates, and testing.

END OF SECTION 26 36 34

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SECTION 26 41 13
LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 SECTION INCLUDES:

- A. Work Included: Provide lightning protection system work as shown, scheduled, indicated, and as specified.

1.03 STANDARDS:

- A. Products and installation shall comply with applicable sections of the latest edition of the following standards:
 - 1. NFPA 780 Lightning Protection Code.
 - 2. LPI-175 Lightning Protection Installation Code.
 - 3. UL 96 Lightning Protection Systems Standards for Components
 - 4. UL 96A Lightning Protection Systems Standards for Installation.
- B. A complete Lightning Protection System shall be provided for the entire building.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Only firms regularly engaged in the manufacture of lightning protection system components whose products have been in satisfactory use in similar service for not less than 5 years shall be used.
- B. Installer: System installed shall be a licensed electrical contractor, LPI certified Master Installer or a n installer with a minimum of 5 years experience as a UL Master Label Installer.
- C. LPI Compliance: The entire installation shall be in accordance with the LPI "Lightning Protection Installation Code", LPI-175 (latest edition), for Class I installations.
- D. Underwriters' Laboratories, Inc. (UL) Labels: All conductors shall bear UL Label at 10' intervals along the length of the conductor. All air terminals shall bear UL Label. The completed installation shall be awarded the Master Label Certificate per UL 96A (latest edition).

1.05 SHOP DRAWING SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Manufacturer's data and cutsheets on all system components including, but not limited to air terminals, braces, and mounting base, main conductors, branch (secondary) conductors, ground electrode (rod, wing plate, or ground plate), bimetal splicers, clamps, fittings, and connectors, and method of roof flashing.
 - 2. Dimensioned drawings in plan view (and riser) showing accurately scaled air terminal layouts, main and branch conductor routing, down conductor location, ground electrode and inspection pit locations, counterpoise routing and all bodies of conductance and inductance connected to the system.
 - 3. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Store lightning protection system materials in a clean, dry space.
- B. Handle carefully to avoid damage or bending of air terminals and components.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: All components of the system shall individually meet the factory inspection requirements of UL 96A for lightning protection materials. All materials shall comply in weight, size, and composition with the requirements of the Underwriters' Laboratories, Inc. and the

National Fire Protection Association Code relating to this type of structure. Materials shall be designed for their intended use, and shall meet the factory inspection requirements of Underwriters' Laboratories, Inc. Provide products as specified in the following paragraphs:

1. Air Terminals: Chrome-tipped, solid copper or aluminum, 98% conductivity, sized per Table 3-1.1b, Class I of NFPA 780 (latest edition).
2. Air Terminal Base Plate: Compatible copper, copper alloy or aluminum suitable for intended mounting.
3. Main and Secondary Conductors, Class I: Copper or aluminum conductors, sized per Table 3-1.1b, Class I of NFPA 780 (latest edition).
4. Ground Electrode: Copper rod, wing plate, or ground plate as required by soil conditions and as required for optimum performance of entire system. Aluminum will not be acceptable.
5. Miscellaneous Hardware: Copper or aluminum, electrically compatible with other major components of the system.
6. Fasteners: A UL-approved type of noncorrosive metal having ample strength to support the conductor.
7. Connectors: Provide connectors as follows:
 - a. Cable Connectors: UL-approved copper, copper-bronze, or cast bronze for use with copper conductors. Provide screw-pressure type using stainless steel bolts and nuts. A UL-approved fusion weld similar to "Cadweld" may be used for underground copper connections.
 - b. Connections to Building Steel or Reinforcing Steel: A UL-approved fusion weld similar to "Cadweld".
 - c. Dissimilar Metals: A UL-approved bimetallic connector.
 - d. Connections to Ground Rods: A UL-approved clamp, or a UL-approved exothermic weld similar to "Cadweld".

PART 3 EXECUTION

3.01 CERTIFICATION:

- A. General: The entire installed lightning protection system shall be an LPI-certified lightning protection system complying with requirements of UL 96A (latest edition) for a Master Label C, which shall be furnished. The installation shall be in accordance with recognized industry practices to ensure that products serve the intended function. All parts of the Lightning Protection System shall be bonded together. The Lightning Protection System shall be installed by a bonded Lightning Protection System Contractor who specializes in lightning protection system engineering and installation.
- B. Equipment shall be located as inconspicuously as possible. Wiring run inside building shall be installed in conduit. Provide installation diagrams for approval before proceeding.

3.02 INSTALLATION:

- A. Aluminum Materials:
 1. Aluminum conductors will not be permitted for installation underground or in corrosive or salt laden atmospheres. If aluminum systems are employed, suitable bimetallic connectors shall be used ahead of copper ground electrode and counterpoise.
 2. Aluminum materials may be employed at any location where aluminum materials are used on the structure, are contiguous to the lightning protection system elements, and are approved by the Engineer. All aluminum elements shall be sized for equal ampacity and conductivity as required for copper.
- B. Exothermic Welds: Exothermic welds will not be permitted on loose weave conductors, but may be used on conductors which are stranded tightly, for sizes 197 MCM and larger.
- C. Down Conductors: Down conductors shall be concealed at all points within the structure.
- D. Visual Access: All points of connection shall have visual access. Provide visual access via inspection pits and similar means.

- E. Cable Runs: Provide a perimeter cable run around the perimeter of the main roof and all penthouses. Provide other cable runs to meet specified requirements. Provide downloads as required to bond cable runs to ground electrodes. Where building structure is steel, the building steel may be used for downloads where permitted.
 - 1. Roof: Exposed and fastened 3' on center maximum. Cable bend shall be minimum 8" radius with maximum 90 degree bends.
 - 2. Underground: Copper cable direct buried.
 - 3. Down Conductors: Concealed and installed in a minimum one inch (1") PVC conduit.
- F. Air Terminals: Provide 18" projection air terminals at a maximum spacing of 20' around perimeter cable runs, and 24" projection air terminals at a maximum spacing of 25' apart through the center of flat roofs.
- G. Metal Bodies of Conductance: Bond all metal bodies of conductance which are located on the roof to the lightning protection system. This includes, but is not limited to exhaust fans, vents, handrails and ladders, metal screens and panels, air conditioning units, pumps, hatches, flag poles, antennas, and any metal body which exceeds the height of air terminals.
- H. Metal Bodies of Inductance: Bond all metal bodies of inductance located within 6' of a cable run or bonded object to the Lightning Protection System. This includes, but is not limited to: flashings; metal coping caps; gravel guards; fascias; roof drains; downspouts; interior ducts, equipment and piping; or in general, any isolated body at or below the roof in the 6' zone mentioned above.
- I. Roof Penetrations: Use properly flashed fittings for non-leaking roof penetrations at downloads and other areas where roof penetrations are required.
- J. Ground Electrodes: Ground rods shall be driven so that the bottom of the rod is at least 10' below grade and not less than 2' from the building wall.
- K. Ground System Loop Interconnection: Lightning ground rods specified shall be interconnected with a bonding loop conductor below the building slab. The loop thus formed shall be bonded to the electric service ground and the transformer ground rods at the point of attachment to the ground rods. Ground connections shall interconnect with the main conductive grounding system of the structure.

3.03 TESTING:

- A. Ground Resistance Test: Perform a ground resistance test for comparison to future inspection and testing data by the Owner. Overall system resistance shall not exceed 25 ohms total. Test shall be performed using a Biddle Megger Earth Tester or equivalent test instrument.
- B. Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit two copies of certified test results for Owner's record and submit four copies of certified test results to Architect for review. Test reports shall include time and date of tests, relative humidity, temperature and weather conditions.

END OF SECTION 26 41 00

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SECTION 26 43 13
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: The extent of transient voltage surge protective device (SPD) work is as shown, scheduled, and as indicated by the requirements of this Section, and as specified elsewhere in these Specifications. This section includes Surge Protective Devices (SPDs) for low-voltage power equipment (1000 VAC and less). Work under this section consists of furnishing all materials necessary for the execution and complete installation of Surge Protective Devices (SPDs).
- B. Types: The types of SPDs required for the project include, but are not limited to:
1. Service Entrance Protectors.
 2. Panelboard Protectors.
- C. SPD Receptacles: Refer to Section 26 27 26, "Wiring Devices".

1.03 STANDARDS:

- A. SPD products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. Underwriters Laboratory (UL)
 - a. UL1449 3rd Edition: Surge Protective Devices (SPD).
 - b. UL1283 5th Edition: Electromagnetic Interference Filters.
 - c. cUL – UL: Evaluation to Canadian Safety Requirements (UL 1449, 1283)
 2. Institute of Electrical & Electronic Engineers (IEEE)
 - a. C62.41.1: 2002 IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.
 - b. C62.41.2: 2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits.
 - c. C62.45: 2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits.
 - d. C62.62: 2000 IEEE Standard Test Specifications for Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits.
 - e. C62.72: 2007 IEEE Guide for the Application of Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits.
 3. National Electrical Manufacturers Association (NEMA).
 4. National Fire Protection Association, NFPA 70, National Electric Code, 2008 (NEC).
 5. Federal Information Processing Standards Publication 94 (FIPS 94), 1983 Guideline on Electrical Power for ADP Installations.
 6. MIL-STD 220A.

1.04 PROJECT CONDITIONS:

- A. Service Conditions: The Surge Protective Device (SPD) shall be rated for continuous operation under the following conditions:
1. Maximum Continuous Operating Voltage (MCOV): 115% to 125% of the nominal operating voltage.
 2. Operating Temperature: -40°C to 60°C.
 3. Relative Humidity: 0% to 95%, non-condensing.
 4. Operating Altitude: 0 feet to 12,000 feet.

1.05 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
 - 1. Current Technologies - SL2 Product Series.
 - 2. Liebert - Interceptor II Series.
 - 3. Thor Systems - TSr Product Series.
- B. UL Label: All SPDs shall be UL labeled.

1.06 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Cut sheets marked to clearly indicate SPD types, sizes, construction, features, accessories, dimensions and other information required to review the proposed SPDs.
 - 2. Submit certified test results for all models as follows:
 - a. Submit UL1449 3rd Edition Voltage Protection Ratings "VPR".
 - b. Submit proof that products are UL *listed and labeled by Underwriters Laboratories* to UL 1449 3rd Edition.
 - 3. Provide warranty statement.
 - 4. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.07 STORAGE AND HANDLING:

- A. Store SPDs devices in a clean, dry space. Maintain factory-wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle SPDs devices carefully to avoid damage to material components, enclosure and finish.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: Except as otherwise indicated, provide SPD manufacturer's standard materials and components as indicated by his published product information, designed and constructed as recommended by the manufacturer, and as required for a complete installation.
- B. The following are the general requirements of the SPD products:
 - 1. Nomenclatures used herein are intended to indicate product type and configuration of equipment required. UL 1449 3rd Edition Listed, bearing the official UL 3rd Edition gold hologram label.
 - 2. UL 1283 5th Edition Listed.
 - 3. The Surge Protective Device (SPD) shall be a stand alone configuration. Systems that must be integral to the switchgear will not be considered.
 - 4. All SPD systems shall be permanently connected, parallel designs. Series suppression elements shall not be acceptable.
 - 5. The SPD shall be marked with a Short Circuit Current Rating (SCCR) and shall not be installed at a point on the system where the available fault current is in excess of that rating per the National Electric Code, Article 285, Section 6.
 - 6. All SPD units shall be from the same manufacturer.
 - 7. SPD designs using a single fuse to protect two (2) or more surge paths shall not be acceptable.
 - 8. SPD designs that limit the 100% rated surge protection shall not be acceptable.
 - 9. Fuse links or printed circuit board trace fusing shall not be acceptable.
 - 10. Hybrid design utilizing:
 - a. Thermally Protected Metal Oxide Varistors.
 - b. Filter capacitors to suppress EMI/RFI electrical noise.

2.02 MODULAR SURGE PROTECTION:

- A. Configured as shown on the riser diagram and/or panel schedules

- B. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below.

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
2500 – 6000A	300	600
1200 – 2000A	250	500
600 – 1000A	200	400
225 – 400A	150	300
125 – 225A	100	200

- C. The SPD shall be rated for 480/277Vac 3 Phase, 4 Wire + Ground, Wye or 208/120Vac 3 Phase, 4 Wire + Ground, Wye.
- D. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each replaceable module shall provide the uncompromising ability to deliver full surge current rating per mode.
- E. SPD modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.
- F. Opening of supplementary protective devices, internal or external, shall not be permissible during UL 1449 3rd Edition Nominal Discharge testing.
- G. Each individual module shall feature a green LED indicating the individual module has all surge protection devices active. If any module is taken off-line, the green LED will turn off and a red LED will illuminate, providing individual module as well as total system status indication.
- H. Monitoring: Solid State Status Indication Lights.
- I. The modular SPD shall be provided in a NEMA 12 or 4X enclosure.
- J. The SPD shall provide EMI/RFI electrical noise attenuation of 36 to 44dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
- K. Voltage Protection Ratings: The UL 1449 3rd Edition Voltage Protection Ratings “VPR” (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below.

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20µs Waveform	Voltage Rating	
	208/120V	480/277V
Line to Neutral	900V	1200V
Line to Ground	800V	1200V
Neutral to Ground	700V	1200V
Line to Line	1200V	2000V

- L. The SPD shall have a minimum UL 1449 3rd Edition Nominal Discharge Current Rating (I_n) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (I_n) rating shall be 20,000 Amps.

2.03 NON-MODULAR SURGE PROTECTION :

- A. Configured as shown on the riser diagram and/or panel schedules.
- B. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below.

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
400 – 800A	150	300
125 – 225A	100	200
15-100A	50	100

- C. The SPD shall be rated for 480/277Vac 3 Phase, 4 Wire + Ground, Wye or 208/120Vac 3 Phase, 4 Wire + Ground, Wye.
- D. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each device shall provide the uncompromising ability to deliver full surge current rating per mode.
- E. All non-modular units shall be factory wired using #10AWG wire: two feet (2') for each phase conductor and three feet (3') for Neutral and Ground conductors.
- F. Continuous LED indication of the system integrity (including N-G mode for a Wye system) utilizing a Green and Red solid state LED. Monitoring: Solid State Status Indication Lights.
- G. The non-modular SPD shall be provided in a compact NEMA 12 or 4X polycarbonate enclosure with a CLEAR cover.
- H. The SPD shall provide EMI/RFI electrical noise attenuation of 32 to 37dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
- I. Voltage Protection Ratings: The let-through voltage test results used to obtain the UL 1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below.

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20µs Waveform	Voltage Rating	
	208/120V	480/277V
Line to Neutral	700V	1200V
Line to Ground	700V	1200V
Neutral to Ground	800V	1200V
Line to Line	1000V	2000V

- J. The SPD shall have a minimum UL 1449 3rd Edition Nominal Discharge Current Rating (I_n) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (I_n) rating shall be 20,000 Amps.

2.04 WARRANTY:

- A. All Surge Protective Devices (SPDs), associated hardware, and supporting components shall be warranted to be free from defects in materials and workmanship, under normal use and in accordance with the instructions provided, for a period of five (5) years.
- B. A detailed warranty statement shall be provided with each unit.

PART 3 - EXECUTION

3.01 INSTALLATION OF SPDs:

- A. General: Install TVSS devices where shown, in accordance with the manufacturer's written instructions and recognized industry practices to ensure that the TVSS devices comply with the requirements and serve the intended purposes. Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's "Standard of Installation", for installation of electrical devices.
- B. SPDs Installation: Install the surge protector in or adjacent to the equipment which it protects. Maximum cable length from the protector to the protected device shall not exceed 3'. The protector status alarm monitor shall be located in the face of the [protector]. Provide power wiring connections and disconnect/overcurrent device as required for connection to the protected equipment bus.
- C. Technical assistance shall be provided by the manufacturer through the efforts of a factory representative or a local distributor.
- D. Verify absence of damage.
- E. The SPD shall be installed in accordance with the manufacturer's printed instructions. All local and national codes shall be observed.

- F. The unit shall be installed of the same voltage rating as the intended protected equipment.
- G. The unit shall be installed on the load side of the service equipment overcurrent device.
- H. The location of the field-mounted SPD shall allow adequate clearances for maintenance.
- I. Lead Length: The mounting of the SPD shall ensure the connecting leads are as short (recommend one 1 meter or less) and straight (no sharp bends) as reasonably possible
- J. Before energizing the SPD, the unit shall be verified as to: correct as specified: manufacturer, product series, and model number.
- K. All voltage modes including L-L (Line-to-Line), L-G (Line-to-Ground), L-N (Line-to-Neutral), and N-G (Neutral-to-Ground) shall be measured and verified against the unit voltage ratings.
- L. Continuity measurements shall be made between the Neutral and Ground connections to verify the Neutral-to-Ground bond.

3.02 TESTING:

- A. Checks: Prior to energization, check SPDs for continuity of circuits and for short circuits.
- B. Demonstration: Subsequent to wire and cable hook-up, energize SPDs and demonstrate proper functioning.

3.03 WARRANTY:

- A. General: The SPDs shall be warranted against defect or failure for one year after substantial completion of the project.
- B. Refer to Section 26 05 53, "Identification for Electrical Systems", for applicable painting and marking of SPDs.

END OF SECTION 26 05 34
E&C Engineers & Consultants Inc.
TX Firm Registration No. F-003068

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: The extent of lighting fixture work is as shown and scheduled, as indicated by the requirements of this Section, and as specified elsewhere in these Specifications. All materials, accessories, and any other equipment necessary for the complete and proper installation of all lighting fixtures included in this Contract shall be furnished by the Contractor.
- B. Types: The types of lighting fixtures required for the project may include, but are not limited to:
1. Fluorescent fixtures.
 2. Exit signs.
 3. Fluorescent emergency battery pack units.
- C. Applications: The applications of lighting fixtures required for the project include, but are not limited to:
1. General lighting.
 2. Specialty lighting.
 3. Emergency, egress and exit lighting.
- D. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
- E. Minor details, not usually indicated on the drawings nor specified, but that are necessary for the proper execution and completion of the fixtures, shall be included, the same as if they were herein specified or indicated on the Drawings.
- F. The Owner shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the fixtures. The responsibility of accurately fabricating the fixtures to the fulfillment of this specification rests with the Contractor.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures.
 2. NEMA WD1 General-Purpose Wiring Devices.
 3. ANSI C82.1 Specification for Fluorescent Lamp Ballasts.
 4. NEMA LE HID Lighting System Noise Criterion (LS-NC) Ratings.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products produced by manufacturers as shown or scheduled for each type of lighting fixture. Identification in the fixture schedule by means of manufacturers' names and catalog numbers is to facilitate establishment of basic features, construction and performance standards. Any substitutions must, in the opinion of the Engineer, meet or exceed these standards. All lighting fixtures with cone type reflectors shall be from the same manufacturer when fixtures are installed in the same room or area, to maintain consistency of reflector colors. Provide products complying with these specifications and produced by one of the following for ballasts, lamps, and battery back-up units:
1. Ballast Manufacturers:
 - a. Advance Transformer Company.
 - b. Universal/Magnetek.

- c. Osram/Sylvania.
- d. Lutron.
- 2. Lamps:
 - a. General Electric Company.
 - b. Osram Sylvania.
 - c. Phillips Lighting Corporation.
- 3. Emergency Battery Back-up Units:
 - a. Bodine.
 - b. Chloride.
 - c. Lithonia.
- B. CBM Label: Provide fluorescent ballasts which comply with Certified Ballast Manufacturers' Association (CBM) standards and carry the CBM mark on the label.
- C. Conformance: Fixtures shall be manufactured in strict accordance with the Drawings and Specifications.
- D. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable federal, state, and local codes and regulations.
- E. UL-listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the Underwriters' Laboratories, Inc. "Standards for Safety," and others as they may be applicable. A UL-listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.
- F. Warranty: All ballasts shall be provided with a two (2) year parts and labor warranty from the date of project acceptance.

1.05 SUBMITTALS:

- A. Shop Drawings submittals shall include, but not be limited to, the following:
 - 1. Submit manufacturer's data on interior and exterior lighting fixtures in booklet form, with separate sheet for each fixture, assembled by fixture "type" in alphabetical order, with the proposed fixture and accessories clearly labeled. Ballast and lamp product data shall accompany fixture submittals.
 - 2. Submit dimensioned drawings and performance data including coefficients of utilization, candela distribution, spacing to mounting height ratio, efficiency and visual comfort probability.
 - 3. Submit details of fixture mounting including frames, trims, canopies, support requirements, and other data pertinent to fixture installation.
 - 4. Submit complete photometric data for each fixture, including optical performance and efficiency rendered by independent testing laboratory developed according to methods of U.S.A. Illuminating Engineering Society as follows:
 - a. For down and semi-down lights used for general illumination: (1) Coefficients of utilization; (2) Visual Comfort Probability data (fluorescent only) for 100 footcandles, in a 20'by 20'room with 10'ceiling and luminaires lengthwise with reflectances of 80% (ceiling), 50% (walls), and 20% (floor); (3) Candlepower data, presented graphically and numerically, in 5 degree increments (0 degrees, 5 degrees, 10 degrees, etc.). If light output is only bilaterally symmetric, data also developed for up and down quadrants normal, parallel, and at 22-1/2 degrees, 45 degrees, and 67-1/2 degrees to lamps; and (4) Zonal lumens stated numerically in 10 degree increments and at angles to lamps as described above.
 - b. For area and roadway luminaires: (1) Isocandela charts; (2) Coefficients of utilization; and (3) IES roadway distribution classification.
 - c. Supply photometric data as described above for any fixture offered in substitution for a specified fixture.
 - 5. After shop drawing approval, and prior to release for manufacturing, the Contract shall furnish one sample of each fixture on the fixture schedule and contract drawings for which sample requirement is noted. Sufficient time shall be allowed for thorough examination of

the samples by the Lighting Consultant. Samples shall be complete, ready for hanging, energizing, and examining, and shall be shipped, prepaid by Contractor, to the Lighting Consultant, or as otherwise advised. Samples are not returnable, nor included in quantities listed for a project. Samples must be an actual working unit of materials to be supplied.

6. Submit details of air handling provisions for fixtures with supply and return air capabilities including, but not limited to: Airflow capacities, pressure drops, boot and connection types and other pertinent data.
7. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver interior lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.
- B. Handle interior lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.
- C. Store interior lighting fixtures in a clean, dry space and protect from the weather.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: Provide lighting fixtures, of the size, type and rating indicated on the Lighting Fixture Schedule, complete with, but not necessarily limited to, lamps, lampholders, reflectors, diffusers, louvers, wire guards, tube guards, ballasts, fuses, starters, and wiring. Fixtures shall be furnished with all required accessories and trim, including hold-down clips, as required for a complete installation in the ceiling-type shown on the Architectural Drawings.
 1. Lighting equipment shall be complete, wired, and including supporting means, such as plaster frames, supports, hangers, canopies, sockets, holders; current or voltage modifiers, such as ballasts, starters; light control materials; specifically diffusers, louvers, lenses, reflectors and refractors; and lamps.
 2. Lighting fixtures shall be designed for highest relative efficiency and service. Maintenance to be simple and relamping possible without use of special tools.
 3. Lighting fixtures shall be constructed and installed in accordance with local building codes and shall bear label of approved testing agent. Materials shall be new and of best grade of approved manufacturing standards. Workmanship shall be of highest order.
 4. Recessed fixtures shall be provided with frames appropriate construction encountered.
 5. Ferrous fixture components shall receive treating to assure corrosion resistance and paint adherence. Aluminum parts, unless made of alloys having inherent corrosion resistance, shall be anodized or coated with oxidation-preventing treatment. Finish shall be baked enamel where color is indicated.
 6. Plastic shall be acrylic.
- B. General Fixture Construction:
 1. All materials, accessories, and other related fixture parts shall be new and free from defects which in any manner may impair their character, appearance, strength, durability and function, and effectively protected from any damage or injury from the time of fabrication to the time of delivery and until final acceptance of the work.
 2. Fabricate fixture enclosures with a minimum of No. 22 gauge cold rolled sheet steel. Enclosures may be constructed of other metals, provided they are equivalent in mechanical strength, and acceptable to the Engineer.
 3. All sheet metal work shall be free from tool marks and dents, and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true of adequate strength and structural rigidity to prevent any distortion during shipping, installation, and while in normal use.
 4. Housings shall be so constructed that all electrical components are easily accessible and replaceable without removing fixtures from their mountings, or disassembly of adjacent construction.

5. All custom light fixtures shall be thoroughly tested in Manufacturer's shop prior to shipment to ensure mechanical and electrical integrity.
6. All fixtures shall be completely wired at the factory.
7. If ceiling system requires, each recessed and semi-recessed fixture shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed. The frames and rings shall be one piece or constructed with electrically-welded butt joints, and of sufficient size and strength to sustain the weight of the fixture.
8. Fixture to be sealed against light leaks between ceiling trims of recessed and semi-recessed lighting equipment and the ceilings. If fixture is used in partially transparent ceiling, fixtures to be sealed against light leaks above the ceiling line.
9. Yokes, brackets and supplementary supporting members needed to mount lighting fixtures to carrier channels or other suitable ceiling members shall be provided as required.
10. Fixtures for use outdoors or in areas designated as wet locations shall be suitably gasketed to prevent the entrance of moisture. Provide approved wire mesh screens for ventilation openings. Damp location fixtures to be of corrosion resistant parts and hardware.
11. In the application and mounting condition specified, fixtures and ballasts must operate within the temperature limits of their design and as specified by Underwriters' Laboratories, Inc.
12. Each lighting fixture which has a beam angle adjustment shall have reliable angle locking device capable of long and continuous use.
13. Each lighting fixture which has a lamp with an oval shape beam pattern shall contain a lamp orientation locking device which will insure that beam orientation is not disturbed during lamp replacement and fixture cleaning.
14. Each light fixture which has a spread lens shall contain lens orientation locking device which will insure that lens orientation is not disturbed during lamp replacement and fixture cleaning.
15. All lamp sockets in lighting fixtures shall be suitable for the specified lamps and shall be set so that lamps are positioned in optically correct relation to all lighting fixture components. If adjustable socket positions are provided, socket should be preset in factory for the specified lamp. If different socket positions are specified for various types of the same fixture, sockets shall be preset for each type, and cartons marked accordingly.

C. Reflectors and Trims:

1. Reflectors, reflector cones and visible trim of all lighting fixtures shall not be installed until completion of plastering, ceiling tile work, painting and general clean-up. They shall be carefully handled to avoid scratching or finger-printing and shall be, at the time of acceptance by the Owner, completely clean.
2. All Alzak parabolic cones shall be guaranteed against discoloration for a minimum of 10 years, and, in the event of premature discoloration, shall be replaced at the expense of the manufacturer for both materials and the cost of labor.
3. Aluminum reflectors shall be finished specular, semispecular, or diffuse as specified and shall meet or exceed Alzak specifications. Minimum requirements for reflector finishes for interior and exterior service shall be as follows:

<u>DESCRIPTION OF SERVICE</u>	<u>MINIMUM WEIGHT OF COATING MG. PER SQUARE INCH</u>	<u>MINIMUM PERCENT REFLECTANCE SPECULAR DIFFUSE</u>	
Normal interior commercial service	5.0	83	75
General interior industrial and exterior work reflector protected by glass covering	7.5	82	73
Exterior industrial and commercial reflector not protected	10	78	75

Exterior marine service reflector
not protected

13

78

65

D. Lenses:

1. Plastic for lenses and diffusers shall be formed of colorless 100% virgin acrylic as manufactured by Rohn & Haas, Dupont or as acceptable to the Engineer. The quality of the raw material must exceed IES, SPI, and NEMA Specifications by at least 100% which, as a minimum standard, shall not exceed a yellowness factor of 3 after 2,000 hours of exposure in the Fade-meter or as tested by an independent test laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded or extruded as specified, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for at least 15 years.
2. Glass used for lenses, refractors, and diffusers in incandescent and HID lighting fixtures shall be tempered for impact and heat resistance; the glass shall be crystal clear with a transmittance of not less than 88%. For exterior fixtures use tempered Borosilicate glass Corning #7740 or as acceptable to the lighting consultant. For fixtures with a radiant energy of 4.16 watts per square inch or greater, directly exposed to the elements and aimed above the horizontal, use Vycor glass.
3. Where optical lenses are used, they shall be free from spherical and chromatic aberrations and other imperfections which may hinder the functional performance of the lenses.
4. All lenses, louvers, or other light diffusing elements shall be removable, but positively held so that hinging or other normal motion will not cause them to drop out.
5. All lenses shall be clean and free of dust at the time of substantial completion.

E. Lamp Holders:

1. Incandescent:
 - a. Body: Porcelain.
 - b. Screw Shell: Nickel-plated brass, prelubricated with silicone compound.
 - c. Contacts: Spring-loaded nickel-plated phosphor bronze.
2. Fluorescent:
 - a. Body: White urea plastic.
 - b. Contacts: Phosphor bronze.
3. High Intensity Discharge:
 - a. Body: Porcelain.
 - b. Screw Shell: Nickel-plated brass, prelubricated with silicone compound.
 - c. Contacts: Spring-loaded nickel-plated phosphor bronze.
4. Lamp holders in lighting fixtures shall be suitable for indicated lamps and shall be positioned to place lamps in optically correct locations in relation to fixture components. If adjustable socket positions are provided, socket should be present in factory for lamp specified. If different socket positions are specified for same fixture, sockets shall be preset for each type, and cartons marked accordingly.
5. Furnish lamp holders which are UL-listed and designed for proper lamp operation and life. Outdoor lamp-holders shall be neoprene-gasketed and compression type. Lamp holders to be appropriate to the specified lamp.

F. Finishes:

1. Painted Surfaces: Synthetic enamel, with acrylic, alkyd, epoxy, polyester, or polyurethane base, light stabilized, baked on at 350°F minimum, catalytically or photochemically polymerized after application.
2. White Finishes: Minimum of 85% reflectance.
3. Frames: Ceiling opening frames shall either be manufactured of nonferrous metal, or be suitably rustproofed after fabrication.
4. Selection: Unless otherwise noted, finishes shall be as selected by the Architect.

5. Undercoat: Except for stainless steel, provide ferrous metal surfaces with a five stage phosphate treatment or other acceptable base bonding treatment before final painting and after fabrication.
 6. Unpainted Surfaces: Unpainted nonreflecting surfaces shall be satin-finished and coated with a baked-on clear lacquer to preserve the surface. Where aluminum surfaces are treated with an anodic process, the clear lacquer coating may be omitted.
 7. Unpainted Aluminum Surfaces: Finish interior aluminum trims with an anodized coating of not less than 7 mg per square inch, of a color and surface finish as selected by the Architect. Finish exterior aluminum and aluminum trims with an anodized coating of not less than 35 mg per square inch, of a color and surface finish as selected by the Architect.
 8. Porcelain Enamel Surfaces: Apply porcelain finishes smoothly. Finish shall be not less than 7.5 mils thick of non-yellowing, white, vitreous porcelain enamel with a reluctance of not less than 85%.
- G. Fixture Fabrication:
1. General: Design components to allow for expansion and contraction for a minimum ambient temperature range of 150°F (37.8°C) without causing buckling, excessive opening of joints or over-stressing of welds and fasteners.
 2. Sheet Metal Work: Form metalwork to required shapes and sizes with true curves, lines, and angles. All sheet metal work shall be free from tool marks and dents, and shall have accurate angles bent as sharp as compatible with the gauges of required metal. Form intersections and joints true with adequate strength and structural rigidity to prevent distortion after assembly. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners wherever possible.
 3. Welding: Comply with AWS for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded joints of all welded flux and dress on all exposed and contact surfaces.
 4. Assembly: Accurately fit all parts of fixture. All joints in metal, not checked, shall be brazed and not soldered. Joints shall be invisible. Where screws are necessary for adjustment of applied ornament, they shall be concealed, as far as possible, and finished to match other metalwork. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration. Assembled fixtures shall be well braced, and of adequate strength to resist sagging or deforming.
- H. Glass:
1. Glassware shall be mechanically strong, properly annealed, and free from internal strain that might cause breakage. Where possible glassware shall be tempered for impact and heat resistance. Unless otherwise noted, all enclosing globes shall match glass of existing fixtures, or if none exists, glassware shall match approved prototype in size, contour, finish and general appearance. Supplied globes shall faithfully reproduce existing globes or approved prototypes in every way, having qualities equal to or better than the approved prototype without sacrifice of any other characteristics such as transparency or translucency and reflection/refraction properties. Glassware supplied shall be of consistently high quality and free from such imperfections as streaks, corns, stones, blisters, checks or other flaws that affect glassware strength or appearance.
 2. Dimensional Tolerances of Glass: All other dimensions of supplied globes shall not vary more than 1% more or less than the respective dimension on the approved prototype. Tolerances for glass thickness shall be set by the Architect and adhered to by the contractor. Each unit of glassware supplied shall be identical to others of that type and faithful to the approved prototype.
 3. All glass ornament in relief and globes shall be blown up fully in molds so as to faithfully replicate approved samples.
 4. Where shown, etch, chase or carve ornament on globes as detailed.
 5. Glass Overage: Furnish 10% additional in number of each size and kind of globe (or a minimum of two, whichever is greater).

- I. Wiring:
 - 1. Generally use SF-2 insulated wire for rewiring existing or new wire at replicated light fixture. SF-1 may be substituted in those locations where space will not permit the installation of SF-2 and where the load is 6 amps or less. Provide 600 volt insulation.
 - 2. Factory-wire all fixtures. Provide leads no shorter than 1'-0" or as required to suit the project application.
- J. Connections:
 - 1. Fasteners: Furnish fasteners of basic metal and alloy, matching finished color and texture as metal being fastened, unless otherwise indicated. For steel and aluminum fixtures, all screws, bolts, nuts, and other fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel fixtures, all hardware shall be stainless steel. For bronze fixtures, all hardware shall be bronze.
 - 2. Welding Materials: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, and as required for color match, strength and compatibility in the fabricated units.
- K. Fixture Types:
 - 1. Fluorescent Fixtures: Provide fluorescent fixtures of the type scheduled on the Lighting Fixture Schedule, complete with ballasts and lamps of the type, color, wattage and size scheduled.
 - a. Provide fluorescent fixtures with heavy white lampholders with definite locking-in feature and contacts for proper lamp operation and life. Outdoor lampholders shall be neoprene gasketed and compression type. Sockets with open-circuit voltage over 300 volts to be safety type and designed to open the supply circuit on lamp removal.
 - b. Fixture body parts, comprising fixture housing, reflectors, wire channels, end plates, ballast housings, and similar body parts, shall be made of extruded aluminum, galvanized stampings, or bonderized steel, as indicated. Housing end plates, socket bridges, reflectors, wiring channels and ballast covers shall be die formed of not less than No. 22 gauge cold rolled steel unless specified otherwise. Mount lamps on rapid-start circuits within one inch (1") of grounded metal, one inch (1") wide minimum and as long as the lamp. Wireways shall have adequate wiring space, accessible after fixture installation. Construct fixtures so that ballast may be serviced or replaced without removal of fixture housing from adjacent construction. Housing shall be adequately ventilated where required. Hardware shall have rustproof finish. Fixture bodies shall be painted after fabrication.
 - c. Temperatures around ballast and in fixture housing shall not exceed 90°C with ambient room temperature at 27°C.
 - d. Lighting fixtures shall have continuous light-seal gaskets seated in such manner as to prevent any light leaking through any portion or around any edge of the trim frame. Other sealing methods shall be individually reviewed.
 - e. Diffusers shall be framed in hinged continuous assembly, except where frameless units are indicated. Frameless units shall be removable without tools and opened or closed by hand pressure. Diffuser frame latches shall be spring-loaded or cam-operated.
 - f. Fluorescent fixture lenses, where required, shall be 100% extruded virgin acrylic, prismatic-type, nominal 0.125" thick, unless specified otherwise. Provide a minimum of eight hold-down lens retaining clips for troffers utilizing framed diffuser lenses.
 - g. Fluorescent fixtures in continuous rows shall be supplied with all fixture couplings, chase nipples, and other accessories recommended by the manufacturer for continuous row installation.
 - h. Fluorescent troffers shall be shipped prelamp, unless noted otherwise.
 - i. Parabolic louver fluorescent troffers shall be shipped with a plastic bag or film to protect the louvers from site conditions. Louver protection shall not be removed until the space where the fixture is installed is complete.

- j. Supply air-type fluorescent fixtures shall be provided with adjustable air pattern control blades.
 - k. Lay-in fixtures shall be provided with hold-down clips per the NEC, minimum two clips per fixture.
 - 2. Exit Signs: Provide exit signs as scheduled on the Lighting Fixture Schedule. Exit lighting fixtures shall meet the requirements of all applicable federal, state, and local codes.
- L. Ballasts:
- 1. Energy Saving Electronic Ballasts - Indoor Fluorescent: Provide UL-listed, low noise, high power factor, rapid start, Class P, thermally protected, encased solid state energy saving ballasts for all indoor lighting fixtures. Ballasts shall operate at a frequency between 20 and 35 kHz and shall produce no visible lamp flicker. Ballasts shall operate lamps on parallel or series circuits and shall deliver normal lamp life. Lamp failure shall not affect ballast life. Ballasts shall comply with all applicable FCC and NEMA standards concerning EMI and RFI emissions and shall meet applicable ANSI standards related to harmonic distortion and surge suppression. Provide ballasts with a maximum power input wattage of 60 watts when installed in a surface-mounted, 2-lamp, strip fixture with standard F34 lamps. Ballast power factor shall be 90% or greater and input current harmonic content shall not exceed 10%. Electronic ballasts shall be Advance Mark V Electronic Integrated Circuit Ballasts or an approved equal by Valmont, MagnaTek, Motorola or Universal. Ballasts shall be mounted in fixtures so as to provide maximum sound attenuation. Use of 3 lamp ballasts is acceptable unless dual level switching is shown on the drawings.
 - 2. Ballasts - HID: Provide UL-listed or CSA-approved high power factor, constant wattage, regulated output/high reactance autotransformer ballasts with a -20°F temperature rating.
 - a. Fabricate core laminations of precision welded diecut high quality steel. Coils shall be of high temperature enameled magnetic wire and precision wound. Coils shall be constructed using materials suitable for operation at 180°C.
 - b. Capacitors shall be highest quality type appropriate to the service intended. Outdoor ballasts shall use capacitors with 90°C temperature rating.
 - c. Recessed fixture ballasts shall be encapsulated or potted with solid fill with a maximum "B" sound rating. Surface and enclosed fixture ballasts shall be core and coil type with a maximum "C" sound rating.
 - d. Ballasts shall be mounted in or on lighting fixtures so as to provide maximum sound attenuation. Provide optional reduced noise ballast packaging where scheduled or shown on the Drawings.
 - e. Indoor mercury vapor ballasts shall be constant wattage autotransformer type with a power factor not less than 90%. Regulation: 13% variation in line voltage shall vary lamp watts by no more than _2%. Ballast shall sustain line voltage drop of 40% without extinguishing lamp.
 - f. Outdoor mercury vapor ballast shall be constant wattage autotransformer type with power factor of not less than 90%. Regulation: _10% variation in line voltage shall vary lamp watts by no more than _5%. Ballast shall sustain line voltage drop of 40% without extinguishing lamp.
 - g. Metal halide ballasts shall be constant wattage autotransformer type with lead peaked circuiting, and power factor of not less than 90%. Regulation: 10% variation in line voltage shall vary lamp watts not more than _10%. Ballast shall sustain line voltage drop of 35% without extinguishing lamp.
 - h. High pressure sodium vapor ballasts shall be the voltage stabilized autotransformer type with not less than 90% power factor. Regulation: 10% variation in line voltage will vary lamp watts not more than _3%. Ballast shall sustain line voltage drop of 20% without extinguishing lamp.
 - i. Where ballasts are remote mounted from lamps, ballast packs provided shall be capable of starting and operating lamps under the lamp/ballast separation and temperature conditions encountered in the installation proposed for the project.

3. Dimming Ballasts: Wherever fluorescent or HID fixtures are to be dimmed, the fixture supplier shall coordinate the type of dimming ballast or pack to be used with the lighting control equipment supplier to ensure compatibility. Magnetic dimming ballasts shall be factory-furnished and installed in light fixtures. Solid state dimming ballasts and dimming packs shall be provided by the lighting control equipment supplier and factory-installed in light fixtures. Dimmed fluorescent lighting fixtures shall be provided with circuit interrupting lampholders where required for the dimming ballast or pack being used.

M. Lamps:

1. General: Provide lamps of the wattage, type, color, and reflector lamps with type of beams indicated, as shown, and as scheduled. Provide extended service lamps that are inside frosted. Provide energy saving lamps for all fluorescent fixtures installed in indoor conditioned locations, unless otherwise noted. Incandescent and tungsten halogen lamps shall not be operated, other than for initial testing, prior to final inspection, or shall be replaced immediately prior to final inspection.
2. Maintenance Stock: Furnish a stock of replacement lamps in the original cartons or packing sleeves, amounting to 10% (but not less than two lamps in each case) of each type and size lamp used in each fixture type. Deliver replacement stock as directed to Owner's storage space.

N. Fluorescent Emergency Battery Backup Unit:

1. General: Provide fluorescent lighting fixtures with emergency battery backup and integral emergency (self-powered) fluorescent power system for each fixture as shown or scheduled on the Drawings. The integral fluorescent emergency power system shall consist of a charger, high frequency inverter, voltage disconnect and a sealed nickel cadmium battery designed for high temperature operation. Provide battery unit with self test feature.
2. Operation: During normal operation, when switched ac is present, the fixture will be fully illuminated by means of the regular ballast. At the same time, the emergency ballast is supplied with nonswitched ac, which transforms and rectifies into a low dc voltage to recharge the battery and maintain it in a fully charged condition. When the nonswitched ac fails, a solid state voltage sensor instantly turns on a high frequency inverter which illuminates one lamp in the fixture at reduced light output for a minimum of 90 minutes. At the end of the rated time a low voltage sensor disconnects the battery to prevent over discharging. When the ac nonswitched returns, the inverter switches off and the battery starts recharging.
3. Battery: (Internal) Sealed Nickel Cadmium - specially constructed to withstand the high temperatures of ballast compartments. 15 year life expectancy; 5 year unconditional and additional 5 year pro rata warranty. Batteries shall not require periodic cycling or full discharge upon use to maintain full battery capacity.
4. Power Requirements: 120 or 277 volts, 60 Hz, for the specified lighting fixtures as indicated on the Lighting Fixture Schedule.
5. Output: Suitable for one F40 fluorescent tube, rapid or instant start, operating at approximately 20% of its nominal light output.
6. Transfer: Solid state-type, automatically and instantly energizes lamp load upon failure of the ac supply. Battery protection circuit automatically shuts down lamp load when battery reaches full discharge.
7. Charger: All solid state, recharges battery in 12 to 24 hours, current limited and short circuit proof.
8. Inverter: All solid state, 87% minimum efficiency uses a fully isolated and protected electronic oscillator to produce an inaudible high frequency output. Inverter will ignite lamp which has burned out under normal conditions.
9. Self-Test: The diagnostic circuit continually monitors battery voltage and charging current, and will communicate a fault by flashing the status indicator lamp. An automatic discharge test is also performed for 30 seconds, every 30 days and for 90 minutes every 12 months.

10. Enclosure: 20 gauge steel painted black baked enamel. Mounts inside the fixture adjacent to normal ballast. Flying leads provided for connections to external test switch and pilot light which is supplied with the unit. Test switch and pilot light shall be furnished to the lighting fixture manufacturer for installation and connection into the fixture by the lighting fixture manufacturer.
11. Warranty: All electronics shall carry a 3 year unconditional warranty. The manufacturer of the unit shall provide three full cycles of discharge and recharge before shipment and shall certify that the testing has been done.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. General:
 1. Install lighting fixtures of the types indicated, where shown, and at the indicated heights in accordance with the fixture manufacturer's written instructions and recognized industry practices to ensure that the fixtures comply with the requirements and serve the intended purposes. Do not scale drawings for exact location of the lighting fixtures. In general, refer to the architectural reflected ceiling plans for proper locations of lighting fixtures. Fixtures shall exactly fit the type of ceiling system scheduled for the space.
 2. Fixtures shown on the fixture schedule to be recessed shall be complete with plaster frames, mounting yokes, rod hangers, etc., and/or any other accessories required to fit the fixture to the ceiling construction. However, where ceiling system cannot maintain said support, fixture supports shall be provided and rigidly attached to the structural members of the building capable of carrying the weight of the fixture plus 200 pounds at each support without sagging. Provide the necessary supports for hangers located between structural members.
- B. Standards: Comply with NEMA standards, applicable requirements of the NEC pertaining to installation of interior lighting fixtures, and with applicable portions of the NECA's "Standard of Installation".
- C. Connection: All individual lay-in fluorescent fixtures in suspended ceilings, shall be connected back to the associated lighting grid outlet box by wire in 3/8" (minimum) flexible metallic conduit fixture-tails in lengths not to exceed 72"; or by Type MC cable fixture-tails where permitted by the local authority having jurisdiction, in lengths not to exceed 8'. All fixture tails shall have ground wire pulled with conductors.
- D. Mounting: Fasten fixtures securely to the indicated structural support members of the building. Provide separate supports or mounting clips for all recessed ceiling-mounted lighting fixtures in accordance with the NEC. Check to ensure that solid pendant fixtures are plumb.
- E. Appurtenances: Install each fixture properly and safely. Furnish and erect hangers, rods, mounting brackets, supports, frames, and other equipment required.
- F. Coordination: Furnish lighting fixtures complete with appurtenances required for the proper, safe and distortion-free installation in the various surfaces in which they appear. Determine surface types from the Architectural drawings.
- G. Instructions: Each lighting fixture shall be packaged with complete instructions and illustrations showing how to install. Install lighting fixtures in strict conformance with manufacturer's recommendations and instructions.
- H. Continuous Row Fixtures: Rigidly align all continuous rows of lighting fixtures for true in-line appearance.
- I. Pendant Fixtures: Install pendant lighting fixture plumb and at a height above the finished floor as specified in the drawings. In cases where conditions make this impractical, refer to the Architect for a decision. Use ball aligners and canopies on pendant fixtures unless noted otherwise.
- J. Suspended Fixtures:

1. Fixture studs shall be provided in all outlet boxes from which fixtures are suspended. Fixtures shall not be suspended by means of cover or canopy screws. Canopies shall completely cover the ceiling opening of all ceiling fixtures except lay-in fixtures in T-bar construction, and trimless fixtures.
 2. Surface-mounted lighting fixtures (i.e. exit lights, etc.) are installed on lay-in panels in T-bar ceiling construction, the outlet boxes shall be rigidly supported to the ceiling system using metal channels spanning perpendicular across the T-bars and securely attached to each side of the outlet box.
 3. Chain-suspended lighting fixtures shall be connected to the outlet box mounted directly above the fixture using flexible metallic conduit strapped to the fixture chain. Suspension chain shall be heavy duty nickel or cadmium-plated.
- K. Outlet Boxes: The locations indicated for outlet boxes of lighting fixtures are diagrammatic. Outlets shall be located as required to coincide with suspension hangers where they occur and with structural and architectural elements of the building and shall be located in accordance with the Architectural Reflected Ceiling Plan.
- L. Fixture Designations: If a fixture-type designation is omitted, furnish fixture of the same type as shown for rooms of similar usage. Verify with Engineer before purchase and installation.
- M. Installation Sequence: Do not install fixtures or such parts as finishing plates and trims for recessed fixtures until all plastering and painting that may mar fixture finishes has been completed. Install reflector cones, baffles, aperture plates, light controlling elements for air handling fixtures, and decorative elements after completion of ceiling tiles, painting and general cleanup.
- N. Mechanical Rooms: Lighting fixture locations in mechanical and electrical equipment rooms are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical and plumbing equipment and to illuminate adequately meters, gauges and equipment. Support all lighting fixtures independently of ductwork, piping and their supports.
- O. Concealment: Whenever a fixture or its hanger canopy is applied to a surface mounted outlet box, a finishing ring shall be utilized as necessary to conceal the outlet box.
- P. Wire Guards/Tube Guards: Wire guards or tube guards shall be provided for all fixtures with exposed lamps where installed in mechanical/electrical spaces; in all locations below 8'-0" above finished floor;] [and where lamps are exposed to damage.
- Q. Fluorescent Lighting Fixtures Installed in UL-rated Ceiling Assemblies: Fixtures shall have armored cable or flexible metallic conduit fixture-tails used for connection of lighting fixtures and shall have wiring installed as follows:
1. Shall be wired through the ends of the fixtures, or shall be provided with 90 degree ells on top of the fixtures, to allow the installation of the UL-approved fire-rated covers by the Ceiling Contractor.
 2. Failure to provide the required connectors shall not relieve this Contractor of his responsibility for replacing the connectors at no additional cost to the Owner.
 3. The UL fire-rated covers shall not be notched by the Ceiling Contractor because of improper wiring connectors installed on the fixtures by this Contractor.
 4. This Contractor shall verify with the Architect/Engineer and the Ceiling Contractor, the specific requirements for the type of UL-rated ceiling assembly being installed.
- R. Fusing: Refer to Section 26 28 13, "Low Voltage Fuses", for fusing for HID ballasts.
- S. Fluorescent Emergency Backup Units: For nonswitched applications connect ac input to switched and unswitched unit inputs, unless noted otherwise on Drawings. For switched applications provide a switched ac input to the unit switched input and a nonswitched ac input to the unit nonswitched input.

3.02 AIMING AND ADJUSTMENT:

- A. All adjustable lighting units shall be aimed, focused, locked, etc., by the Contractor under the supervision of the Lighting Consultant. The Lighting Consultant shall indicate the number of crews (foreman and apprentice) required. All aiming and adjusting shall be carried out after the entire installation is complete.
- B. All ladders, scaffolds, etc. required for aiming and adjustment shall be furnished by the Contractor at the direction of the Lighting Consultant. As aiming and adjustment is completed, locking setscrews and bolts and nuts shall be tightened securely.
- C. Units shall be focused during the normal working day, where possible. However, where daylight interferes with precise focusing, aiming shall be accomplished at night.

3.03 CLEANUP:

- A. At the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturers, all broken parts shall have been replaced, and all lamps shall be operative. Replace blemished, damaged, or unsatisfactory fixtures as directed by Architect.

3.04 MAINTENANCE:

- A. The Contractor shall be responsible for obtaining from his supplying lighting manufacturers, for each type of lighting fixture, a recommended maintenance information which shall be included in the Project Operating and Maintenance Manuals. Minimum information shall include:
 - 1. Tools required.
 - 2. Types of cleaners to be used.
 - 3. Replacement parts identification list.
 - 4. Final as-built shop drawings.

3.05 WARRANTY:

- A. The Contractor shall warrant all fixtures, their finishes, and all of their component parts, except ballasts, to be free from defects for a period of one year from date of acceptance, if operated within rated voltage range. Ballasts shall be warranted for 2 years. Fixture installation shall be warranted for one year from the date of acceptance of the installation. During the warrantee period, repair or replacement of defective materials and/or repair of faulty workmanship or installation shall be provided at no cost to the Owner within 10 days of written notice of the defects as recorded and submitted by the Owner and/or Architect.

3.06 TESTING:

- A. General: Upon completion of installation of lighting fixtures and after building circuitry has been energized, apply electrical energy to demonstrate proper operation of lighting fixtures and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units and proceed with retesting.
- B. Lamps: Install all new incandescent lamps just prior to final inspection. Fluorescent and HID lamps may be utilized in the final finishing of the building. Replace gaseous discharge lamps that are defective, show discolorations, or have exceeded more than 1/3 of their rated life, as per Engineer/Owner's records, with new lamps for final inspection.
- C. Preinspection Tasks: Immediately before final inspection, thoroughly clean all fixtures inside and out, including plastics and glassware, adjust all trim to properly fit adjacent surfaces, replace broken or damaged parts and lamp, and test all fixtures for electrical and mechanical operation. Any fixtures or parts of fixtures, which have begun to show signs of rust or corrosion at the time of completion of the job, shall be removed and replaced with properly protected metal parts.

END OF SECTION 26 51 00

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SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: The extent of lighting fixture work is as shown and scheduled, as indicated by the requirements of this Section, and as specified elsewhere in these Specifications. All materials, accessories, and any other equipment necessary for the complete and proper installation of all lighting fixtures included in this Contract shall be furnished by the Contractor.
- B. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
- C. Minor details, not usually indicated on the drawings nor specified, but that are necessary for the proper execution and completion of the fixtures, shall be included, the same as if they were herein specified or indicated on the Drawings.
- D. The Owner shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the fixtures. The responsibility of accurately fabricating the fixtures to the fulfillment of this specification rests with the Contractor.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
1. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures.
 2. NEMA WD1 General-Purpose Wiring Devices.
 3. ANSI C82.1 Specification for Fluorescent Lamp Ballasts.
 4. NEMA LE HID Lighting System Noise Criterion (LS-NC) Ratings.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: Provide products produced by manufacturers as shown or scheduled for each type of lighting fixture. Identification in the fixture schedule by means of manufacturers' names and catalog numbers is to facilitate establishment of basic features, construction and performance standards. Any substitutions must, in the opinion of the Engineer [and Lighting Consultant], meet or exceed these standards. [All lighting fixtures with cone type reflectors shall be from the same manufacturer when fixtures are installed in the same room or area, to maintain consistency of reflector colors.] Provide products complying with these specifications and produced by one of the following for ballasts, lamps, and battery back-up units:
1. Ballast Manufacturers:
 - a. Advance Transformer Company.
 - b. Universal/Magnetek.
 - c. Osram/Sylvania.
 - d. Lutron.
 2. Lamps:
 - a. General Electric Company.
 - b. Osram Sylvania.
 - c. Phillips Lighting Corporation.
- B. CBM Label: Provide fluorescent ballasts which comply with Certified Ballast Manufacturers' Association (CBM) standards and carry the CBM mark on the label.
- C. Conformance: Fixtures shall be manufactured in strict accordance with the Drawings and Specifications.

- D. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable federal, state, and local codes and regulations.
- E. UL-Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the Underwriters' Laboratories, Inc. "Standards for Safety," and others as they may be applicable. A UL-listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.
- F. Warranty: All ballasts shall be provided with a two (2) year parts and labor warranty from the date of project acceptance.

1.05 SUBMITTALS:

- A. Shop Drawings submittals shall include, but not be limited to, the following:
 - 1. Submit manufacturer's data on interior and exterior lighting fixtures in booklet form, with separate sheet for each fixture, assembled by fixture "type" in alphabetical order, with the proposed fixture and accessories clearly labeled. Ballast and lamp product data shall accompany fixture submittals. Submittals for custom fixtures shall include complete dimensioned fabrication drawings and descriptive text adequate to allow the proposed fixture materials and construction to be evaluated.
 - 2. Submit dimensioned drawings and performance data including coefficients of utilization, candela distribution, spacing to mounting height ratio, efficiency and visual comfort probability.
 - 3. Submit details of fixture mounting including frames, trims, canopies, support requirements, and other data pertinent to fixture installation.
 - 4. After shop drawing approval, and prior to release for manufacturing, the Contractor shall furnish one sample of each fixture on the fixture schedule and contract drawings for which sample requirement is noted. Sufficient time shall be allowed for thorough examination of the samples by the Lighting Consultant. Samples shall be complete, ready for hanging, energizing, and examining, and shall be shipped, prepaid by Contractor, to the Lighting Consultant, or as otherwise advised. Samples are not returnable, nor included in quantities listed for a project. Samples must be an actual working unit of materials to be supplied.
 - 5. Submit details of air handling provisions for fixtures with supply and return air capabilities including, but not limited to: Airflow capacities, pressure drops, boot and connection types and other pertinent data.
 - 6. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver exterior lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.
- B. Handle exterior lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.
- C. Store exterior lighting fixtures in a clean, dry space and protect from the weather.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: Provide lighting fixtures, of the size, type and rating indicated on the Lighting Fixture Schedule, complete with, but not necessarily limited to, lamps, lampholders, reflectors, diffusers, louvers, wire guards, tube guards, ballasts, fuses, starters, and wiring. Fixtures shall be furnished with all required accessories and trim, including hold-down clips, as required for a complete installation in the ceiling-type shown on the Architectural Drawings.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. General:
1. Install lighting fixtures of the types indicated, where shown, and at the indicated heights in accordance with the fixture manufacturer's written instructions and recognized industry practices to ensure that the fixtures comply with the requirements and serve the intended purposes. Do not scale drawings for exact location of the lighting fixtures. In general, refer to the architectural reflected ceiling plans for proper locations of lighting fixtures. Fixtures shall exactly fit the type of ceiling system scheduled for the space.
 2. Fixtures shown on the fixture schedule to be recessed shall be complete with plaster frames, mounting yokes, rod hangers, etc., and/or any other accessories required to fit the fixture to the ceiling construction. However, where ceiling system cannot maintain said support, fixture supports shall be provided and rigidly attached to the structural members of the building capable of carrying the weight of the fixture plus 200 pounds at each support without sagging. Provide the necessary supports for hangers located between structural members.
- B. Standards: Comply with NEMA standards, applicable requirements of the NEC pertaining to installation of interior lighting fixtures, and with applicable portions of the NECA's "Standard of Installation".
- C. Appurtenances: Install each fixture properly and safely. Furnish and erect hangers, rods, mounting brackets, supports, frames, and other equipment required.
- D. Coordination: Furnish lighting fixtures complete with appurtenances required for the proper, safe and distortion-free installation in the various surfaces in which they appear. Determine surface types from the Architectural drawings.
- E. Instructions: Each lighting fixture shall be packaged with complete instructions and illustrations showing how to install. Install lighting fixtures in strict conformance with manufacturer's recommendations and instructions.
- F. Outlet Boxes: The locations indicated for outlet boxes of lighting fixtures are diagrammatic. Outlets shall be located as required to coincide with suspension hangers where they occur and with structural and architectural elements of the building and shall be located in accordance with the Architectural Reflected Ceiling Plan.
- G. Concrete Pole Bases for Grade-mounted Installations: Branch circuit conduit for grade-mounted installations shall be routed underground into the concrete base and stubbed up with bushing into the center of the pole base. Conduit shall not be exposed on pole base. Provide 8' of bare #8 copper wire coiled at the bottom of the base in sand fill and secured to the ground lug on the pole. The length of the concrete bases below grade shall be as indicated on the Drawings or as recommended by the Architect/ Structural Engineer. Where the pole bases are installed in parking lots and along drives where exposed to vehicle traffic, the bases shall extend a minimum of 30" above finish grade. Where pole bases are installed in grass or landscape areas, (located away from the parking areas) the bases shall extend a minimum of 3" above finish grade. Refer to Section 26 05 01, "ELECTRICAL Basic Materials and Methods", for additional requirements.

3.02 CLEANUP:

- A. At the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturers, all broken parts shall have been replaced, and all lamps shall be operative. Replace blemished, damaged, or unsatisfactory fixtures as directed by Architect.

3.03 MAINTENANCE:

- A. The Contractor shall be responsible for obtaining from his supplying lighting manufacturers, for each type of lighting fixture, a recommended maintenance information which shall be included in the Project Operating and Maintenance Manuals. Minimum information shall include:
1. Tools required.
 2. Types of cleaners to be used.
 3. Replacement parts identification list.
 4. Final as-built shop drawings.

3.04 WARRANTY:

- A. The Contractor shall warrant all fixtures, their finishes, and all of their component parts, except ballasts, to be free from defects for a period of one year from date of acceptance, if operated within rated voltage range. Ballasts shall be warranted for 2 years. Fixture installation shall be warranted for one year from the date of acceptance of the installation. During the warranty period, repair or replacement of defective materials and/or repair of faulty workmanship or installation shall be provided at no cost to the Owner within 10 days of written notice of the defects as recorded and submitted by the Owner and/or Architect.

3.05 TESTING:

- A. General: Upon completion of installation of lighting fixtures and after building circuitry has been energized, apply electrical energy to demonstrate proper operation of lighting fixtures and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units and proceed with retesting.
- B. Lamps: Install all new incandescent lamps just prior to final inspection. Fluorescent and HID lamps may be utilized in the final finishing of the building. Replace gaseous discharge lamps that are defective, show discolorations, or have exceeded more than 1/3 of their rated life, as per Engineer/Owner's records, with new lamps for final inspection.
- C. Pre-inspection Tasks: Immediately before final inspection, thoroughly clean all fixtures inside and out, including plastics and glassware, adjust all trim to properly fit adjacent surfaces, replace broken or damaged parts and lamp, and test all fixtures for electrical and mechanical operation. Any fixtures or parts of fixtures, which have begun to show signs of rust or corrosion at the time of completion of the job, shall be removed and replaced with properly protected metal parts.

END OF SECTION 26 56 -00

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SECTION 27 00 10

GENERAL REQUIREMENTS FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section and the associated drawings identify the requirements, technical design, and specifications for Communication Systems at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. Functionally complete Communications Systems shall be provided in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result shall be provided whether specifically called for or not, at no additional cost to Owner.
- C. The Communications Systems include the following:
 - 1. 27 05 33 – Pathways for Communications Systems
 - 2. 27 10 00 – Structured Cabling System
 - 3. 27 41 00 – Integrated Audiovisual Systems
 - 4. 27 51 23 – Intercommunications System

1.2 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 0 and 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for Electrical System requirements.
- C. Refer to Division 28 for Electronic Security requirements.

1.3 CONFIDENTIALITY

- A. Limit access to physical and electronic versions of these Division 27 specifications and associated Drawings to individuals directly involved in performing the Work.
- B. Pursuant to Texas Statute 418.182, certain portions of Division 27 specifications and associated drawings relate "to the specifications, operating procedures, or location of security system used to protect public or private property from an act of terrorism or related criminal activity" and as such are confidential.

1.4 ABBREVIATIONS

- A. ADA – Americans with Disabilities Act

- B. AFF – Above Finished Floor
- C. AHJ – Authority Having Jurisdiction
- D. ANSI – American National Standards Institute
- E. AV – Audiovisual
- F. BOM – Bill of Materials
- G. CAT – Category
- H. CD – Construction Document
- I. DAS – Distributed Antenna System
- J. EMI – Electromagnetic Interference
- K. EMT – Electrical Metallic Tubing
- L. ERRCS – Emergency Responder Radio Coverage Systems
- M. FACP – Fire Alarm Control Panel
- N. FCC – Federal Communications Commission
- O. F/UTP – Foiled, Unshielded Twisted Pair
- P. GC – General Contractor
- Q. GMP – Guaranteed Maximum Price
- R. GUI – Graphical User Interface
- S. HVAC – Heating, Ventilation, and Air-Conditioning
- T. IBC – International Building Code
- U. IDF – Intermediate Distribution Frame; a secondary Telecommunications Room/Enclosure
- V. ISO – International Organization for Standardization
- W. ISP – Internet Service Provider
- X. IT – Information Technology
- Y. LAN – Local Area Network
- Z. MDF – Main Distribution Frame; the main Telecommunications Room/Enclosure
- AA. MPOE – Main Point of Entry
- BB. MTBF – Mean Time Between Failures

- CC. NEC – National Electric Code
- DD. NEMA – National Electrical Manufacturers Association
- EE. NFPA – National Fire Protection Association
- FF. NRTL – Nationally Recognized Testing Laboratory
- GG. OEM – Original Equipment Manufacturer
- HH. OSP – Outside Plant
- II. PoE – Power over Ethernet
- JJ. POS – Point of Sale
- KK. POTS – Plain Old Telephone Service
- LL. RF – Radio Frequency
- MM. RFI – Request for Information
- NN. RMC – Rigid Metal Conduit
- OO. RU – Rack Unit
- PP. ScTP – Screened Twisted Pair
- QQ. STP – Shielded Twisted Pair
- RR. TIA – Telecommunications Industry Association
- SS. TR – Telecommunications Room
- TT. U/FTP – Unshielded Twisted-Pair Cable with Foil Screened Twisted-Pair Conductors
- UU. UL – Underwriters Laboratory
- VV. UPS – Uninterruptible Power Supply
- WW. UTP – Unshielded Twisted Pair
- XX. VLAN – Virtual LAN

1.5 DEFINITIONS

- A. Wherever used in the Division 27 specifications, or associated drawings, and printed with initial capital letters; the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. If any of these terms are defined in the General Conditions in Division 1, those definitions shall take precedence.

1. Addenda – written or graphic instruments issued prior to the completion of initial bids, which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. Bidding Documents – the Bidding Requirements and the proposed Contract Documents (including all Addenda).
3. Bidding Requirements – The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
4. Change Order – A document recommended by Design Consultant which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
5. Telecommunication(s) Room – A generic term for a dedicated room for information technology equipment, frequently referred to as Telecommunications Room, Telecom Room, IDF, MDF, IT Room, or Equipment Room.
6. Telecommunication(s) Enclosure – A generic term for a dedicated enclosure for information technology equipment, frequently referred to as Telecommunications Enclosure.
7. Contract – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
8. Contract Documents – Those items so designated in the agreement between Owner and Contractor covering the Work. The Contract Documents are complementary; what is required by one is as binding as if required by all.
9. Contractor – The individual or entity with whom Owner has entered into the Agreement.
10. Design Consultant – the design firm responsible for creation of these Division 27 specifications and associated Drawings – Atlas Consulting.
11. Drawings – The part of the Contract Documents prepared or approved by Design Consultant which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
12. General Requirements – Sections of Division 1 of the Specifications.
13. Laws and Regulations – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
14. Owner – the individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
15. Project – the total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
16. Samples – physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which established the standards by which such portion of the Work will be judged.
17. Shop Drawings – all drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
18. Site – lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of the Contractor.
19. Specifications – the part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
20. Subcontractor – an individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

21. Substantial Completion – the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Architect/Design Consultant, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
22. Supplementary Conditions – the part of the Contract Documents which amends or supplements these General Conditions; Division 0 & Division 1 of these Contract Documents.
23. Supplier – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
24. Underground Facilities – all underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
25. Work – the entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

B. Terminology

1. The words and terms below are not defined, but when used in Division 27 specifications and related Drawings, have the indicated meaning:
 - a. Intent of Certain Terms and Adjectives:
 - 1) The Contract Documents include the terms “as allowed,” “as approved,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Design Consultant. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Design Consultant as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Design Consultant any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the following provisions or any other provision of the Contract Documents.
 - 2) Limitations on Design Consultant’s Authority and Responsibilities
 - a) Design Consultant will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Design Consultant will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.

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- b) Design Consultant will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 - b. Day – the word “Day” means a calendar day of 24 hours measured from midnight to the next midnight. Typical “Day” is indicative of business hours, Monday-Friday.
 - c. Defective – the word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1) Does not conform to the Contract Documents; or
 - 2) Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3) Has been damaged prior to Substantial Completion.
 - d. Furnish – the word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - e. Install – the word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - f. Provide – the word “provide” and “perform,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 - g. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied, and those services, materials and equipment shall be furnished and installed.
- C. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contractor Documents in accordance with such recognized meaning.

1.6 REFERENCE STANDARDS

- A. Standards, Specifications, Codes, Laws, and Regulations
 - 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
 - 2. For referenced standards and guidelines that have not been adopted into code or law, the most recent version / edition of the standard and guideline shall be followed, except for the following:
 - 3. Where the Contract Documents clearly establish size, quantity, and/or quality of services, materials, or equipment and/or the means, methods, techniques, sequences, or procedures of construction; in these instances, Contract Documents requirements shall take precedence.
 - 4. Whenever the Contract Documents details a requirement that violates an adopted code, law, or regulation, submit RFI to Architect/Design Consultant prior to Bid or performing the Work.
- B. Codes and Regulations

1. The following codes, laws and regulations are known to have requirements that affect Communications Systems and are listed here for reference. Refer to Part 1 Coordination paragraph in this section for requirements when there are any discrepancies between these codes, laws and regulations and the Contract Documents. All codes shall meet the required 2021 City of Austin Adopted Codes.
 - a. 2010 ADA Standards for Accessible Design
 - b. ASCE 07 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures
 - c. FCC Rules and Regulations
 - d. National Electric Safety Code
 - e. NFPA 70 – National Electric Code
 - f. NFPA 72 – National Fire Alarm and Signaling Code
 - g. NFPA 101 – Life Safety Code
 - h. NFPA 1225 – Standard for Emergency Services Communications
 - i. 2012 Texas Accessibility Standards

- C. Standards
 1. Refer to individual sections for additional requirements.

- D. Guidelines
 1. Refer to individual sections for additional requirements.

- 1.7 QUALITY ASSURANCE
 - A. Contractor Qualifications
 1. Refer to individual sections for requirements.

 - B. Personnel Qualifications
 1. At all times during the progress of the Work, Contractor or Subcontractor shall assign a competent Project Manager who shall not be replaced without written notice to Owner and Design Consultant except under extraordinary circumstances.
 2. Refer to individual sections for additional requirements.

 - C. Network and Cybersecurity Requirements
 1. Network integrity is critical to Owner's operation of the Facility. Refer to Software, Network, and Cybersecurity Requirements paragraph in Part 3 of this Section.

- 1.8 WARRANTY
 - A. Contractor's General Warranty and Guarantee
 1. If the General Requirements do not establish Contractor's General Warranty and Guarantee, then the following requirements are in effect for Communications Systems Work:
 - a. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Design Consultant and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

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- b. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1) Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2) Normal wear and tear under normal usage.
 - c. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1) Observations by Design Consultant.
 - 2) Recommendation by the Architect/Design Consultant or payment by Owner of any progress or final payment.
 - 3) The issuance of a certificate of Substantial Completion by Architect/Design Consultant or any payment related thereto by Owner.
 - 4) Use or occupancy of the Work or any part thereof by Owner.
 - 5) Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Design Consultant.
 - 6) Any inspection, test, or approval by others; or
 - 7) Any correction of defective Work by Owner.

B. Manufacturer Warranty

- 1. Refer to individual sections for additional requirements.

C. Special Warranty

- 1. Refer to individual sections for additional requirements.

1.9 SUBMITTALS

A. General Submittal Requirements:

- 1. Refer to General Requirements or Division 1 for general submittal requirements. Refer to individual sections in Division 27 for additional requirements.
- 2. Submittals and Shop Drawings shall not utilize the Design Consultant's logo, stamp, or the title block from the Construction Drawings; if either of these are submitted, the Submittal(s) will be rejected without review.
- 3. Inadequate or Incomplete Submittals and/or Shop Drawings will not be reviewed and will be returned to the Contractor.

B. Pre-Bid

- 1. Pre-Bid submittals can generally include:
 - a. Clarifying questions.
 - b. Product Substitution requests.
 - c. Contractor and personnel qualification documentation.
- 2. Refer to individual sections for specific Pre-Bid requirements.

C. Bid

- 1. Refer to individual sections for additional Division 27 requirements due with Bid, which may include – but is not limited to – the following:

- a. Contractor and personnel qualification documentation
- b. Unit Pricing

D. Pre-Construction

1. Procedures:

- a. Before submitting Pre-Construction submittals, Contractor shall have:
 - 1) Reviewed and coordinated each Shop Drawing with other Shop Drawings and with the requirements of the Work and the Contract Documents.
 - 2) Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
 - 3) Determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 4) Determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- b. With each submittal, Contractor shall give Design Consultant specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separates from the Shop Drawings or submittal; and, in addition, by a specific notation made on each Shop Drawing submitted to Design Consultant for review and approval of each such variation.
- c. Design Consultant's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents.
- d. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect/Design Consultant.
- e. Contractor shall ensure submittals are submitted in a timely manner to ensure all products can be ordered and received on site in order to not cause any delays. If there are any concerns with any products having long lead times, those products shall be clearly identified in writing so the review and approval can be expedited.
- f. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will be returned unreviewed.
- g. Each submittal shall be sub-divided by the corresponding specification section. Provide a line-by-line compliance statement for each section, identify the following per article and sub-section:
 - 1) Compliant – Following the specification
 - 2) Non-Compliant – Not following the specification with an explanation. If there is a deviation from the specs, prior approval shall have been submitted and approved.
- h. Contractor shall submit the following Pre-Construction Submittals:
 - 1) 27 00 10 – General Requirements for Communications
 - 2) 27 05 33 – Pathways for Communications Systems
 - 3) 27 10 00 – Structured Cabling System
 - 4) 27 41 00 – Integrated Audio-Visual Systems
 - 5) 27 51 23 – Intercommunications System

2. Bill-of-Materials / Product Index

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- a. Provide a typed listed with each product/equipment being provided as part each Section. List shall include the following, in the exact same order as listed in Division 27 specifications:
 - 1) Product/Equipment specification name
 - 2) Manufacturer
 - 3) Model name
 - 4) Model number
 3. Product Data
 - a. Provide product data sheet for each material, equipment, device, etc. listed in Part 2 of these specifications. Data sheet shall include manufacturer name, product name, part number and relevant product specifications in an 8.5"x11" PDF format.
 - b. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified may not be approved.
 4. Shop Drawings
 - a. Shop Drawings shall include the following:
 - 1) Contractor or Subcontractor's Title Block; drawing size shall match Construction Drawings (i.e., 30" x 42"). Title Block shall include:
 - a) Project name and address
 - b) Contractor/Subcontractor company name and contact information.
 - c) Name and contact information of Contractor/Subcontractor's Project Manager.
 - 2) Legend page with all symbols defined.
 - 3) Floors plans (minimum scale of 1/8" = 1'-0") for all areas with Division 27 Work. Floor plans shall include north arrow, key plan, and indicate device/equipment locations, and associated pathway routing and size.
 - 4) Enlarged plans (minimum scale of 1/4" = 1'-0") and rack and wall elevations for Telecommunications Room/Enclosure, Equipment Rooms, etc., indicating exact location where equipment is intended to be installed. Enlarged plans shall include north arrow.
 - 5) Riser diagrams, details, coordination views, etc. to indicate Contractor has a full understanding of required Work and is coordinated with other trades.
 - b. Where installation location is critical – such as in Telecommunications Room/Enclosure and Equipment Rooms, as well as outlet/device location height above finished floor – indicate figured dimension on Shop Drawings.
 - c. Refer to individual sections for additional Shop Drawing requirements.
 5. Samples
 - a. Refer to individual sections for requirements.
 6. Certificates
 - a. Refer to individual sections for requirements.
- E. Refer to individual sections for additional Pre-Construction Submittal requirements.
- 1.10 PROJECT CLOSEOUT
- A. Bill-of-Materials / Product Index – Update Bill-of-Materials that was included in the Pre-Construction Submittal with actual equipment installed. Include columns populated with the following information:
1. Product Name (from Specifications)
 2. Manufacturer
 3. Model Number

4. Quantity
 5. Manufacturer Warranty Period
- B. Product Data (Cutsheets)
1. Shall be in the same order as listed in the Specifications and Bill-of-Materials.
- C. Operation and Maintenance Data
1. Shall be in the same order as listed in the Specifications and Bill-of-Materials.
- D. Warranty Documentation
1. Include PDF copy of any Warranty documentation and/or certifications that came with the installed products or required by these Specifications.
 2. Shall be in the same order as listed in the Specifications and Bill-of-Materials.
- E. Test Results
1. Include PDF copy of Functional Test Reports for each section.
 2. Refer to individual sections for testing requirements.
- F. Spare Parts and Tools
1. At time of Owner Training, furnish any and all spare parts and tools to the Owner that are required by the Contract Documents.
 2. In the Project Closeout Submittal, include PDF copy of delivery receipt, indicating items and quantities that were furnished to the Owner, as well as the date, time, and Owner Representative that took possession of the items.
 3. Refer to individual sections for additional requirements.
- G. Record Drawings (“As Built”)
1. Maintain a copy of approved Submittals, Shop Drawings, and Change Orders on the Site (or the Project’s Construction Administration website), and update with changes during construction. Any minor changes to the Drawings shall be updated on a weekly basis. These drawings shall be made available for inspection at any point during construction when requested by the Architect/Design Consultant.
 2. At the conclusion of the project, utilize AutoCAD or BIM software (such as Revit or Navisworks) to incorporate the changes to the Shop Drawings.
 3. PDF markups will not be acceptable.
 4. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
 5. Refer to individual sections for additional requirements.
- H. Special Requirements – Refer to individual sections for additional requirements.
- 1.11 COORDINATION
- A. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to the Architect/Design Consultant any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has knowledge of, and shall obtain a written interpretation or clarification from the Architect/Design Consultant before proceeding with any Work affected thereby.

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- B. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to the Architect/Design Consultant in writing. Contractor shall not proceed with the Work affected thereby until an amendment or supplement to the Contract Documents has been issued.
- C. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- D. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- E. Refer to General Requirements / Division 1 for Schedule requirements. Subcontractors for Division 27 Work shall coordinate with Contractor in establishing schedules and timetables to perform the Work and perform that Work per those established schedules.
- F. The Contractor/Subcontractor for each Division 27 Section shall maintain a Project Manager (per the Quality Assurance paragraph of that Section) that is on the jobsite whenever Work for that Section is being performed. This Project Manager shall coordinate the Work with other trades, such that Division 27 Work is installed per the Schedule, with the required clearances for all Divisions of Work, and meets the required codes and standards.
- G. Division 27 Work shall not impair, hinder, or delay work of other trades.
- H. Before starting Work, examine adjacent Work performed by other divisions (trades) to determine if there are any conditions that would be detrimental or prevent Division 27 Work from being a successful installation. Notify issues to Contractor for remediation prior to starting Work.
- I. Unless otherwise indicated with a figured dimension, Drawings are schematic - indicating approximate location of devices and equipment. Communications devices and equipment may be figure-dimensioned on the Architectural Drawings, which take precedence over the approximate locations on the technology Drawings. Where neither Architectural or technology Drawings include a figured dimension, exact location shall be determined by scaled dimension and coordination with requirements of other trades. Errors that could have been avoided by proper coordination shall be corrected without additional costs to the Owner.
- J. Coordination with other Division(s):
1. Division 21 Fire Suppression
 - a. Ensure no piping is routed overhead through a Telecommunications Room or Equipment Room, except where serving a Fire Suppression Device in the Communications/Equipment Room.
 2. Division 22 Plumbing
 - a. Ensure no piping is routed overhead through a Telecommunications Room/Enclosure or Equipment Room.
 3. Division 23 Mechanical
 - a. Ensure no piping or ductwork is routed overhead through a Telecommunications Room/Enclosure or Equipment Room, except where serving Mechanical equipment in the Communications/Equipment Room.

4. Division 26 Electrical
 - a. Ensure no conduits are routed overhead through a Telecommunications Room/Enclosure or Equipment Room, except where serving an Electrical panelboard or receptacles in the Communications/Equipment Room.
 - b. Coordinate exact location of receptacles/ hard-wired circuits for Division 27 equipment with Division 26 Contractor prior to rough-in installation.
 - c. Prior to connecting Division 27 devices and equipment to an electrical receptacle, utilize a ground circuit impedance tester to detect any wiring errors and low equipment ground impedances. If any issues are detected, notify Division 26 Contractor for correction prior connecting Division 27 devices and equipment.
5. Division 28 Security

K. Preinstallation Meetings

1. Refer to individual sections for additional requirements.

L. Sequencing / Scheduling

1. Refer to individual sections for specific sequencing / scheduling requirements.

1.12 PERMITS AND TAXES

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.
- B. Unless otherwise provided in the Supplementary Conditions, Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

1.13 DELEGATION OF PROFESSIONAL DESIGN SERVICES

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Design Consultant will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed 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 Design Consultant.

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- C. Owner and Design Consultant shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Design Consultant have specified to Contractor all performance and design criteria that such services must satisfy.
 - D. Pursuant to this Paragraph, Design Consultant's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Materials and equipment incorporated into the Work shall be as specified and of good quality and new, except as otherwise noted in the Contractor Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by these specifications or when requested by the Owner or Design Consultant, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- B. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
- C. Performance Criteria
 - 1. Regulatory Requirements
 - a. Utilize products listed by a National Recognized Testing Laboratory (such as UL), except where no relevant standard exists. These products shall bear a permanent mark/label of the NRTL.
 - b. All equipment and material used in the installation shall be listed for the environment in which it is being installed. Examples – plenum-rated were installed in a return air plenum; wet or outdoor listed where installed in Wet or Damp Locations.
 - c. Refer to individual sections and products for specific NRTL requirements.
 - 2. Sustainability Characteristics
 - a. Refer to General Requirements / Division 1 for general Project and Product Sustainability requirements.
 - b. Refer to individual Division 27 sections and products for specific Sustainability requirements.
- D. Lead Time Issues
 - 1. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect/Design Consultant prior to submitting a Bid for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the Work as required.

- E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.
- F. In the event of a discrepancy between these Specifications and the Drawings, the greater quantity and/or better quality shall be assumed for Bidding purposes.

2.2 SUBSTITUTES AND "OR EQUALS"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to the Architect/Design Consultant for review under the circumstances described below.
 - 1. "Or-Equal" Items: If, in the Design Consultant's approval, an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Design Consultant as an "or-equal" item, in which case review and approval of the proposed item may, in Design Consultant's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. In the exercise of reasonable judgment, the Design Consultant determines that:
 - 1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics.
 - 2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole.
 - 3) It has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work
 - 1) There will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) It will confirm substantially to the detailed requirements of the item named in the Contract Documents.
 - 2. Substitute Items:
 - a. If, in the Design Consultant's approval, an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under the Paragraph above, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Design Consultant to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by the Design Consultant from anyone other than Contractor.
 - c. Contractor shall make written application to the Architect/Design Consultant for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. Requests for substitution must be submitted ten calendar days prior to the bid date, any request received after that time period will be excluded from consideration. The application:
 - 1) Shall certify that the proposed substitute item will:
 - a) Perform adequately the functions and achieve the results called for by the general design

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- b) Be similar in substance to that specified
 - c) Be suited to the same use as that specified
 - 2) Will state:
 - a) The extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time
 - b) Whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item
 - c) Whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty
 - 3) Will identify:
 - a) All variations of the proposed substitute item from that specified, and
 - b) Available engineering, sales, maintenance, repair, and replacement services; and
 - 4) Shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
 - d. Cost Reimbursement: in certain situations, evaluating a proposed substitution will require additional time by the Design Consultant. These situations will either be described in subsequent Specification sections or conveyed in writing to the Contractor prior to evaluation by the Design Consultant. Design Consultant will record Design Consultant's costs in evaluating the proposed substitution. Whether or not Design Consultant approves the proposed substitution, Contractor shall reimburse Owner for the reasonable charges of Design Consultant for evaluating each proposed substitute. Contractor shall also reimburse Owner for the reasonable costs for Design Consultant, Architect, and Engineer(s) in making changes in the Contract Documents resulting from the acceptance of each proposed substitute.
- B. Proposed equivalent items shall be approved by Design Consultant prior to purchase or installation. Proposed equivalent items shall meet or exceed these specifications and the specifications of the specified item.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Verification of Conditions

1. Underground Facilities

- a. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Communications Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Design Consultant by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1) Owner and Design Consultant shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

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- 2) The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a) Reviewing and checking all such information and data.
 - b) Locating all Underground Facilities shown or indicated in the Contract Documents.
 - c) Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d) The safety and protection of all such Underground Facilities and repairing any damage.
 - e) Thereto resulting from the Work.
 - b. Not Shown or Indicated:
 - 1) If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Architect/Design Consultant. Architect/Design Consultant will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- B. Preinstallation Testing
1. Refer to individual sections for requirements.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
- D. No deviations from the Contract Documents shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Architect/Design Contractor prior to proceeding with the work, the contractor shall not be reimbursed for the work.
- E. Cleaning
1. During the progress of the Work, Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations. Contractor shall dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
 2. Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

F. Protection

1. The Contractor shall protect Communications Work from damage by other trades and theft.
 - a. Any Division 27 cabling that has more than 2-inches of paint on the jacket shall be replaced without additional cost to the Owner.
2. Where owner-furnished or provided equipment is installed prior to Substantial Completion, access to that room or area shall be restricted/locked whenever unoccupied.

G. Temporary Power, HVAC, and Communications Systems

1. Where owner-furnished or provided active equipment is required to be installed prior to Substantial Completion in order for Communications Systems Work to be functional, the room or area where that network equipment is installed shall be equipped with permanent or temporary power and heating/cooling at no additional costs to the Owner. Acceptable temperature range is 60 to 80 degrees Fahrenheit.
2. When, through no fault of the Owner or Architect/Design Consultant, Communications Systems Work is not completed by Substantial Completion, temporary Communications Systems may be required while the Site is partially occupied by the Owner and shall remain installed until acceptance of permanent system(s); refer to individual sections for requirements.

3.2 REPAIR / RESTORATION

- A. Contractor shall be responsible for the repair of any damage caused by the Contractor or Subcontractors during the installation.
- B. Selective demolition may be necessary to facilitate installation of Communications Systems equipment and pathways. The Contractor shall obtain written permission from the Architect/Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings. After installation, Contractor shall restore floors, walls, roofs, and ceilings to their original condition.
 1. Avoid penetrations or installation of equipment onto or through waterproof assemblies such as roofs, exterior walls, and slab-on-grade floors. If installation cannot be avoided, install before waterproofing; protect installation area from weather/elements until sealing and waterproofing is complete.
 - a. Conduit and backboxes concealed or embedded in walls or floors may remain. Provide stainless steel cover over backbox openings that are not reused.
 2. Properly dispose of equipment and associated cabling, conduit, pathways and supports in compliance with local, state, and federal laws.

3.3 FUNCTIONAL AND PERFORMANCE TESTING

- A. After components have been installed, perform functional tests to ensure system components are installed and configured correctly in conformance with manufacturer's instruction and the Contract Documents. Correct any issues and retest. Include Test Report documentation in Preliminary and Final Project Closeout Submittals.
- B. Third-party testing or manufacturer onsite services may be necessary for certain Division 27 systems or sub-systems; refer to individual sections for exact requirements.

- C. Refer to individual sections for additional testing requirements.

3.4 FIELD OBSERVATIONS

- A. A minimum of two weeks in advance, notify Design Consultant and Owner as to the readiness for a Field Observation for the following:
 - 1. Rough-In Observation – after conduits have been installed, but before walls have been installed.
 - 2. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.
 - 3. Final Site Observation – a minimum of two weeks before Substantial Completion, to occur after Preliminary Project Closeout Submittal has been submitted.
- B. Non-Conforming Work
 - 1. After receipt of written notice of defective Work, Contractor shall correct all defective Work, or, if the Work has been rejected by the Architect/Design Consultant, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages arising out of or relating to such correction or removal.

3.5 DEMONSTRATION, TRAINING, AND ADJUSTMENTS

- A. Conduct training sessions to Owner's personnel to demonstrate system operation and preventative maintenance procedures.
 - 1. Refer to individual sections for additional training requirements.
- B. After Owner has taken occupancy, Communications Systems equipment and components may require minor adjustments to be performed by the Contractor/Subcontractor to align with Owner's actual use of the systems. Refer to individual sections for specific adjustment requirements.

3.6 SOFTWARE, NETWORK, AND CYBERSECURITY REQUIREMENTS

- A. Software Requirements
 - 1. All firmware found in products furnished or provided by the Contractor shall be the latest and most up to date provided by the manufacturer.
 - 2. All equipment requiring users to log on using a password shall be configured with user/site-specific password(s). No system/product default passwords shall be allowed. Coordinate user logins and passwords with Owner prior to system setup.
 - 3. Refer to individual sections for additional software requirements.
- B. Network and Cybersecurity Requirements
 - 1. For all Communications Systems that have Contractor-provided equipment with an Ethernet/LAN port, Contractor shall coordinate with Owner's IT staff regarding Owner's network and cyber security requirements.

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2. As a part of the pre-installation meetings, the Contractor (and/or Subcontractors for each Communications System) shall request an IT Coordination Kickoff Meeting with Owner's IT staff to ascertain and document Owner's requirements. Contractor shall document this meeting and send meeting minutes to all parties in attendance as well as Architect/Design Consultant.
 3. At a minimum, coordinate the following network requirements for Contractor-provided equipment with the Owner's IT staff:
 - a. IP address quantities and assignments for each equipment type and location, including subnets and subnet masks.
 - b. PoE quantities and power requirements (PoE, PoE+, high powered PoE, etc.) for each equipment type and location.
 - c. Bandwidth requirements, including any prioritization or unicast/multicast requirements.
 - d. VLAN use and assignment.
 - e. Encryption requirements
 - f. WAN connection requirements
 - g. Tunnel requests for access through an Owner's network
 - h. Planned approach for software upgrades and security patching.
 - i. Follow additional network requirements and procedures as directed by the Owner's IT staff.
 4. The Contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owner's technology infrastructure and network. These measures shall include but are not limited to:
 - a. The Contractor shall scan contractor-provided or furnished equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the equipment to the Owner's network.
 - b. Coordinate with the manufacturer to ensure newly procured equipment does not have any cybersecurity notices, bulletins, or alerts. Provide a letter to the Design Consultant with the submittal documents for that Specification section confirming there are no active or known cyber threats.
 - c. Ensure all installers/technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics.
 - d. The Contractor shall assess whether there are any cyber threats / vulnerabilities associated with the specified equipment, prior to procurement/installation. If cyberthreats are discovered, notify the Design Consultant within one Day. Provide the make and model of the associated equipment and the vulnerability.
 - e. Follow additional cybersecurity requirements and procedures as directed by the Owner's IT staff.
 5. Refer to individual sections for additional Networking and Cybersecurity Requirements.

3.7 MAINTENANCE

A. Warranty Service

1. Pursuant to Contractor's General Warranty and Guarantee, Owner may request Warranty Service for a period of 1 year after Substantial Completion for Communications Systems components due to faulty material or installation.
2. Upon written notice from Owner, promptly perform remedial / corrective Work to bring the associated system(s) to compliance with the Contract Documents and satisfaction of the Owner.
 - a. In this context, "promptly" means within 7 Days, unless a quicker response and remediation time is specified in the associated Division 27 specification section.
3. Refer to individual sections for additional Warranty Service requirements.

B. One Year Warranty Check

1. Fifty weeks after Substantial Completion, Contractor or Subcontractor for each Division 27 section shall conduct a site visit with Owner's facility personnel to ensure systems and components are still operating as intended / required by the Contract Documents. Promptly perform corrective Work while on site or within 7 Days.
 - a. Pursuant to Contractor's General Warranty and Guarantee, corrective Work is not required if system / component is deficient due to:
 - 1) Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2) Normal wear and tear under normal usage.

3.8 DRAWINGS AND SPECIFICATIONS AFTER SUBSTANTIAL COMPLETION

A. Contractor and any Subcontractor or Supplier shall not:

1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by Atlas Consulting, including electronic media editions; or
2. Reuse any such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Atlas Consulting.

B. The prohibitions in the paragraph above survive final payment, or termination of Contract. Nothing herein shall preclude Contractor or Owner from retaining copies of the Contract Documents for record purposes.

C. Physical paper copies of Drawings and Specifications shall be properly destroyed (shredded) when no longer needed to perform the Work.

END OF SECTION 27 00 10

SECTION 27 05 33

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section identifies the requirements, technical design, and specifications for the Pathways for Communication Systems at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. The conduit and backboxes shall be in compliance with TIA-569 and the latest version of the NFPA 70 (NEC), with local amendments, and shall include all components needed to ensure proper system performance and code compliance as specified.
- C. Contractor shall include materials, equipment, and labor necessary to provide a complete and functional conduit system regardless of any items not listed or described in this specification or associated drawings.

1.2 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Divisions 0 and 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for Electrical System requirements.
- C. Refer to Division 28 for Electronic Security requirements.

1.3 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Building Industry Consulting Service International (BICSI)
 - 1. Telecommunications Distribution Methods Manual
 - 2. Outside Plant Design Reference Manual
 - 3. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
 - 4. NECA/BICSI 607-2011 - Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

5. ANSI/BICSI N2-2017 – PoE Installation
 6. ANSI/BICSI 004-2018 – Healthcare
 7. ANSI/BICSI 006-2020 - DAS
- E. International Electrotechnical Commission (IEC)
- F. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)
1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
 2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
 3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
- G. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
- H. National Electrical Manufacturers Association (NEMA)
- I. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
 2. NFPA-101, Life Safety Code
 3. NFPA 1225 – Standard for Emergency Services Communications
- J. Occupational Safety and Health Administration (OSHA)
- K. Telecommunications Industry Association (TIA)
1. ANSI/TIA/EIA-569-C, Commercial Building Standard for Telecommunications Pathways and Spaces
 2. ANSI/TIA-569-B Amendment 1, Commercial Building Standard for Telecommunications Pathways and Spaces, 2009
 3. ANSI/TIA/EIA-606-B, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2012
 4. ANSI/TIA/EIA-607-B, Commercial Building Grounding and Bonding Requirements for Telecommunications, 2011
 5. ANSI/TIA-758, Customer-Owned Outside Plant Telecommunications Infrastructure Standard, 2004
- L. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
 2. RUS Bull 1751F-643 (2002) Underground Plant Design
 3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
 4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
 5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
 6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
 7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
 8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

- M. Underwriters Laboratories, Inc. (UL)
 - 1. UL 910 (NFPA 262 1990) Applicable Flame Test

1.4 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. The Contractor shall have been in business for a minimum of five (5) years.
 - 2. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
 - 3. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
 - 4. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.5 COORDINATION

- A. Coordination with other Divisions and Sections
 - 1. Division 26 Electrical
 - 2. Section 27 10 00 – Structured Cabling System
 - 3. Section 27 41 00 – Integrated Audiovisual Systems
 - 4. Section 27 51 23 – Intercommunications System
- B. Preinstallation Meeting / Coordination with Owner
 - 1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Design Consultant, and Owner regarding Work specified in this Section. This meeting is meant to:
 - a. Review Scope of work, schedule, and escalation procedures.
 - b. Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 - 2. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. For devices and equipment with no part number specified, submit product cutsheet for a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- B. All conduit, backboxes, equipment, and installation materials shall be new and of the highest quality.
- C. Labels on all conduit, backboxes, materials, and equipment must indicate a nationally recognized testing laboratory.

2.2 CONDUIT AND ACCESSORIES

A. Electrical Metal Tubing (EMT)

1. Shall meet ANSI C80.3
2. Shall meet UL797
3. Shall come in sizes .5"-4"
4. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal

B. Intermediate Metal Conduit (IMC)

1. Shall meet ANSI C80.6
2. Shall meet UL1242
3. Shall include integrated coupling
4. Shall come in sizes .5"-4"
5. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal

C. Flexible Metal Conduit (FMC)

1. Shall be stainless steel type 316
2. Shall include integrated coupling
3. Shall come in sizes .5"-4"
4. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal

D. Schedule 40 and 80 PVC Conduit

1. Shall meet UL651
2. Shall be manufactured in the standards of NEMA TC-2
3. Shall be sunlight resistant
4. Shall come in sizes .5"-4"
5. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal

E. Liquid-Tight Non-Metallic Conduit

1. Shall be sunlight resistant
2. Shall be galvanized
3. Shall have PVC jacket
4. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal

2.3 OUTSIDE PLANT ACCESSORIES

A. Fabric Innerduct – Detectable

1. Shall be a halogen free
2. Shall have pull-string, with a 1250lb rating, pre-installed

3. Shall be capable of being detected via direct wired toning
4. Approved Manufacturers:
 - a. MaxCell MXED series
 - b. Or Approved Equal

B. Splice Case

1. Listed for installation in below grade vault
2. Sized to support splices of all fiber strands entering the vault/splice case
3. Fully populated with splice trays
4. Approved Manufacturers:
 - a. CommScope
 - b. Panduit
 - c. Coyote
 - d. Or Approved Equal

C. Hand Hole – 11" x 20" x 12"

1. HDPE Construction
2. T-Type Solid Cover with Security Screw
3. Shall provide a minimum load (ANSI) rating of T22
4. Approved Manufacturers:
 - a. Hubbell/Quazite
 - b. Or Approved Equal

D. Hand Hole – 12" x 12" x 12"

1. HDPE Construction
2. T-Type Solid Cover with Security Screw
3. Shall provide a minimum load (ANSI) rating of T15
4. Approved Manufacturers:
 - a. Hubbell/Quazite
 - b. Or Approved Equal

2.4 ABOVE CEILING PATHWAYS

A. J-Hooks

1. Shall be listed as meeting UL 2239 requirements
2. Plenum-rated
3. Shall be designed and equipped with accessories (if needed) to be supported by the following methods:
 - a. Threaded rod from structure
 - b. Wall-mounted to concrete/CMU walls or wood or metal studs
 - c. Beam clamps
 - d. Optional "multi-tiered" mounting to bottom of J-hook
 - e. Optional Fastener to raised floor pedestal
4. Equipped with retainer or strap over top of J-hook once cables are installed
5. Sized to support quantity of installed cables, plus 25% spare capacity
6. Approved Manufacturers:
 - a. Caddy
 - b. Panduit PanNet
 - c. Tomarco Series 200
 - d. Or Approved Equal

B. Hook & Loop Straps

1. Plenum-rated
2. Velcro construction with hook/loop strap
3. Color: black
4. Approved Manufacturers:
 - a. Panduit Tak-Ty Plenum Ties
 - b. VELCRO ONE-WRAP
 - c. Or Approved Equal

C. Exterior Surface Mounted Pull Box

1. Shall be a minimum of 12" W x 12" H x 4" D
2. Shall be NEMA 4X and IP66 Rated
3. Shall have a minimum thickness of 14GA for the Body/Cover
4. Shall have a minimum of (1) 1" connector and (2) 3/4" connectors
5. Approved Manufacturers:
 - a. Hoffman
 - b. Or Approved Equal

2.5 FIRE-STOPPING

A. Fire Rated Sleeve Pathways

1. Steel Construction
2. Vertical or Horizontal Mounting Accessories
3. Self-Adjusting Intumescent Foam Pads
4. Gangable up to 6-Gang
5. Approved Manufacturers:
 - a. Specified Technologies Inc. – EZ-PATH
 - b. Hilti
 - c. Or Approved Equal

B. Conduit Penetration

1. For metallic conduit or tube to be installed through 1-or 2-hour fire-rated wall or floor.
 - a. Specified Technologies - UL System No. W-L-1222 with SpecSeal LCI Sealant (Gyp or Stud Walls)
 - b. Specified Technologies – UL System No. C-AJ-1353 with SpecSeal LCI Sealant Concrete floors or walls
2. Backboxes In Fire- Or Smoke-Rated Walls
 - a. For Communications backboxes to be installed in 1- or 2-hour fire-rated or smoke-rated walls.
 - b. STC sound rating – 64 or higher (related to specific construction)
 - c. Shall meet criteria of UL263 and classified for up to 2 hours as a Wall Opening Protective Material (Category CLIV)
 - d. Approved Manufacturers:
 - 1) Specified Technologies – SpecSeal Power Shield
 - 2) Or Approved Equal

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the laws, ordinances, and rules; the matter shall be referred to the Architect/Design Consultant for direction before proceeding with that part of the work.
- B. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines.
- C. No deviations from the plans or specifications shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Architect/Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

3.2 SYSTEM REQUIREMENTS

- A. Conduit and Sleeves
 - 1. The minimum size conduit that shall be allowed will be 1-inch.
 - 2. EMT Conduit shall be used for all interior installations.
 - 3. Minimum of Schedule-40 PVC conduit shall only be installed in concrete or exterior of the building to include in slab, under slab, etc.
 - 4. Conduit shall be sized as indicated on the Technology drawings. If no conduit size is indicated, then they shall be sized per TIA-569.
 - 5. Conduits shall not have more than the equivalent of (2) 90-degree bends or 180 degrees without the installation of a pull-box or hand hole.
 - 6. For Interior Installations – conduits shall have a pull-box installed when the conduit exceeds 100 feet.
 - 7. For Exterior Installations – conduits shall have a hand hole or vault installed when the conduit exceeds 450 feet.
 - 8. All conduits and sleeves shall be reamed after cutting to ensure there are no sharp edges or burrs on the conduit that could damage the cable.
 - 9. All conduits and sleeves shall have a nylon bushing installed on the open end of the conduit.
 - 10. Conduits and sleeves shall not be shared with any other discipline unless specifically approved in writing by the Architect/Design Consultant.
 - 11. Contractor is responsible for field coordination to ensure conduits and sleeves are separated from electrical conduits, and steam or hot water pipes.
 - 12. Unless indicated otherwise, all conduits shall be concealed under or within floor slabs, within finished walls, or above ceilings.
 - 13. All conduits shall be installed parallel with or at right angles to ceilings, walls, and structural members.
 - 14. Restrictions Applicable to EMT
 - a. Do not install underground.
 - b. Do not encase in concrete, mortar, grout, or other cementitious materials.

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- c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms and parking garages where moving or replacing equipment could physically damage the EMT.
 - 1) In those locations, provide IMC or RMC.
 - d. Do not use outdoors.
15. Restrictions Applicable to PVC
- a. Do not install in the interior of a building.
 - b. Do not install in plenum spaces.
 - c. PVC conduit shall be Schedule 40 or 80 as indicated on the technology drawings.
 - d. Convert nonmetallic conduit to plastic-coated rigid before rising through floor slab. Plastic coating shall extend maximum of 4 inches above floor.
16. Install and ground in accordance with NFPA 70 and TIA-569. In addition, bond telecommunications conduit in accordance with TIA 607.
17. Conduit Through Floor Slabs - Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.
18. Directional Changes in Conduit Runs
- a. Make changes in direction of runs with symmetrical bends.
 - b. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits.
 - c. Prevent plaster, dirt, or trash from lodging in conduits, boxes, and fittings during construction. Free clogged conduits of obstructions.
19. Sleeves through floors shall be rigidly supported utilizing a cast in place as the preferred method or using a Unistrut rack system and shall extend through either side of the ceiling/floor a minimum of 4-inches.
20. Sleeves through walls shall be rigidly fastened to the studs and extend a minimum of 4-inches on either side.
- B. Conduit and Sleeve Supports
- 1. Support conduit and sleeves in underground installations using 2-inch duct spacers.
 - 2. Support conduit and sleeves in interior installations using pipe straps, wall brackets, hangers, or ceiling trapeze.
 - 3. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work.
 - 4. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both tie wires supporting ceiling grid system, and ceiling grid system into which ceiling panels are placed.
 - 5. Supporting means shall not be shared between telecommunication raceways and electrical raceways, mechanical piping, or ducts.
 - 6. Installation shall be coordinated with above-ceiling electrical and mechanical systems to assure maximum accessibility to all systems.
 - 7. Conduit and sleeves shall be supported by a trapeze or wall support brackets.
 - 8. A minimum of 3/8" all-thread shall be used for trapeze supports.
 - 9. Support in accordance with NFPA 70 at intervals not to exceed 3' from the box and every 10' afterwards.
 - 10. Conduit and sleeves shall be no less than 3" above a lay-in ceiling.
 - 11. Conduit and sleeves shall be rigidly supported and level.
 - 12. All supports shall attach to structure or a rigid surface.
 - 13. Supports shall not be shared with any other discipline unless specifically approved by the Architect/Design Consultant.
- C. Backboxes and Junction Boxes

1. Locknuts and Bushings
 - a. Fasten conduits to sheet metal boxes with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing.
 - b. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits and provide insulating type where required by NFPA 70.
2. Provide overhead pull boxes in telecommunication raceway systems at least every 100' and /or when 180 degrees in bends are exceeded when installing conduit on the interior of a building. Size per the following table:

Conduit Trade Size	Width	Length	Depth	Width Increase for Additional Conduit (of same size)
1"	4"	4"	3"	Same size, up to (2) conduits
1-1/4"	6"	20"	3"	3"
1-1/2"	8"	28"	4"	4"
2"	8"	36"	4"	5"
2-1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
4"	16"	60"	8"	6"

3. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, or when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated.
4. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system.
5. Wall Boxes for telecommunications shall be minimum 4 11/16" square and 2 1/8" deep, unless otherwise noted.
6. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.
7. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces.

D. Backbox and Junction Box Supports

1. Backboxes installed in a sheet rock wall shall be supported using the Caddy box mounting bracket.
2. Support boxes on suspended ceilings independently of ceiling supports.
3. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lock washers and nuts or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces.
4. Support sheet metal boxes directly from building structure or by bar hangers.
5. Boxes installed in a wall shall be flush with the wall upon completion.
6. Extension Rings – Extension rings are not permitted for new construction unless specifically approved in writing by the Architect/Design Consultant.

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7. Mounting Heights of Boxes
 - a. Mount telecommunications outlets at height(s) as indicated on the Technology Drawings.
 8. Provide ladder rack as indicated on the Drawings using manufacturer-approved hardware and installation methods.
 9. Provide vertical cable runway using manufacturer-approved hardware and installation methods to provide transition and support where cables enter or exit the Communications Room.
 10. Overhead ladder rack shall be installed 3" above provided racks.
 11. Provide radius drops cross member and stringers above each rack using manufacturer-approved hardware and installation methods where cables exit the horizontal section of the ladder rack.
 12. Bond each cable runway section to the next utilizing ground straps and ensure metal-to-metal contact. Bond closet section of that cable runway to TGB/TMGB in the room.
- E. System Labeling
1. All interior conduits exceeding 50' shall be permanently labeled at each end and every junction box/pull box.
 2. All exterior conduits whether buried or under structure shall be permanently labeled at each end.
 3. All Maintenance Holes, Hand Holes, junction boxes or pull points shall be permanently labeled.
 4. Labels shall be machine-printed.
- F. Firestopping
1. Labeling: Affix adhesive wall label immediately adjacent to devices / conduits on both sides of wall/floor to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.
 2. Fire-rated pathway devices
 - a. Provide fire-rated pathway devices wherever Division 27 cabling or Division 28 Electronic Security cabling needs to pass through a fire-rated wall, whether the device sizes and quantities were identified on the Drawings or not. Devices shall be sized for installed cable size and quantity, plus 25% spare capacity.
 - b. Where multiple devices are required or noted being adjacent to each other, provide manufacturer accessories to "gang" the devices together.
 3. Testing Requirements
 - a. Conduit System
 - 1) Each outside plant conduit shall have a 6" -long mandrel ½-"smaller than the inside diameter of the conduit passed from each end to ensure the conduit is not damaged.
 - 2) The Architect/Design Consultant shall be notified in order to be present for this testing. Any failure shall be corrected by removing and reinstalling new conduits.
 4. Project Closeout Documentation
 - a. As-Built Drawings
 - 1) Drawings shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect/Design Consultant.
 - 2) As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
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- 3) Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all cable pathways, and labeling scheme.

END OF SECTION 27 05 33

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section, and the associated T-Drawings and Contract Documents, identify the requirements, technical design, and specifications for the Structured Cabling System at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. A functionally complete Structured Cabling System and supporting equipment shall be provided in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result shall be provided whether or not specifically called for, at no additional cost to Owner.

1.2 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Divisions 0 and 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for Electrical System requirements.
- C. Refer to Division 28 for Electronic Security requirements.

1.3 DEFINITIONS

- A. Advanced System Warranty – an extended warranty of at least twenty-five years offered by the Structured Cabling System manufacturer that covers the material, installation, and performance of the cabling system.
- B. Cable ID – the outlet and cable labeling scheme, coordinated with the Owner and compliant with TIA-606 Standard.
- C. Certified Contractor – a local contractor with an office within one-hundred miles of the Project Site that is certified with the manufacturer that will be providing the Advanced System Warranty.
- D. ScTP – screened twisted pair
- E. STP – shielded twisted pair
- F. UTP – unshielded twisted pair
- G. Refer to Section 27 00 10 for additional definitions.

1.4 REFERENCE STANDARDS

A. Codes and Regulations

1. Refer to Section 27 00 10 for additional codes and regulations.

B. Standards

1. BICSI N1 – Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
2. IEEE 83 –Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System
3. IEEE 802 Standards
4. IEEE 1100 – Recommended Practice for Powering and Grounding Electronic Equipment
5. NECA 1 – Standard for Good Workmanship in Electrical Construction
6. NECA 331 – Building and Service Entrance Grounding and Bonding
7. NECA/BICSI 607 – Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
8. TIA 568.0-D – Generic Telecommunications Cabling for Customer Premises
9. TIA 568.1-D – Commercial Building Telecommunications Cabling Standard
10. TIA 568.2-D – Balanced Twisted-Pair Telecommunications Cabling and Components Standard
11. TIA 568.3-D – Optical Fiber Cabling Components
12. TIA 569 – Telecommunications Pathways and Spaces
13. TIA 606 – Administration Standard for Telecommunications Infrastructure
14. TIA 607 – Generic Telecommunications Bonding and Grounding for Customer Premises

C. Additional Standards

1. BICSI 004 - Information Communication Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
2. BICSI 005 – Electronic Safety and Security System Design and Implementation Best Practices
3. TIA 758 – Customer-Owned Outside Plant Telecommunications Infrastructure Standard

D. Guidelines

1. BICSI - Telecommunications Distribution Methods Manual
2. BICSI – Outside Plant Design Reference Manual
3. BICSI – Information Technology Systems Installation Methods Manual

1.5 QUALITY ASSURANCE

A. Contractor Qualifications

1. The Contractor shall possess all relevant Manufacturer Certifications (i.e., structured cable systems, testing equipment, etc.) for both the company and individual technicians prior to submitting a bid for the work.
2. The Contractor shall have been in business for a minimum of five (5) years.
3. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
4. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

5. Contractor shall be a Certified Contractor of the manufacturer providing the Advanced System Warranty prior to submitting a Bid for the Work.
6. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

B. Personnel Qualifications

1. Project Manager/Quality Control Manager - At all times during the progress of the Work, Contractor (or Subcontractor) responsible for the Work of this Section shall assign a competent full-time employee (who shall be available for all on-site coordination meetings) with the following current qualifications / credentials:
 - a. RCDD certification
2. Fiber Termination and Testing – those responsible for terminating and testing fiber optic cabling shall have the following qualifications:
 - a. BICSI Installer 2, Optical Fiber
 - b. Or equivalent from Advanced System Warranty manufacturer
3. Copper Testing – those responsible for testing copper cabling shall have the following qualifications:
 - a. BICSI Installer 2, Copper
 - b. Or equivalent from Advanced System Warranty manufacturer
4. Cabling Technicians – those responsible for installing fiber and copper cabling shall have the following qualifications:
 - a. BICSI Installer 1
 - b. Or equivalent from Advanced System Warranty manufacturer
5. Include certificates of the above personnel per Submittal requirements or when requested by Owner or Design Consultant.

1.6 WARRANTY

A. Manufacturer Warranty

1. The Structured Cabling System cabling and terminations shall be covered by a minimum twenty five-year Advanced System Warranty. This warranty shall cover material and performance of the cabling system for the duration of the warranty period. Any valid warranty claims shall be corrected promptly at the manufacturer's expense (for both material replacement and installation labor), with no additional costs to the owner. The Advanced System Warranty shall be provided through a Certified Contractor.
2. Fiber Optic and Copper cabling and terminations shall be covered by the Advanced System Warranty.
3. All other equipment and components required by this Section shall be covered by a manufacturer's warranty for a period of at least one year.

1.7 SUBMITTALS

A. Pre-Bid

1. Refer to Division 27 00 10 for all specification deviation requests.
2. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section and Section 27 00 10 are met.

B. Bid

1. Unit Pricing
 - a. Provide unit cost to add/delete a single plenum Category 6A drop, assumed to be at distance of 300' with all associated cabling, pathways, and other work.
2. Contractor and Personnel Qualifications
 - a. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section are met. Indicate quantity of full-time local technicians within one-hundred-mile radius of Project Site.
 - b. Also include list of three Contractor-installed projects of a similar size and scope that have been in operation for at least one year. Provide the following information for each project:
 - 1) Project Name and Location
 - 2) Project Start and Completion Dates
 - 3) Project Start and Completion Costs
 - 4) Brief Description of Project
 - 5) Client Point of Contact Name and Phone Number

C. Pre-Construction

1. Pre-Construction Submittal for this Section shall include the following:
 - a. Contractor Qualifications –
 - 1) Certifications for Project Manager and all technicians expected to work on the Project.
 - 2) Documentation Contractor has been in business for at least five years.
 - 3) Address of Contractor's local office within one-hundred-mile radius of Project Site.
 - 4) Subcontractors – list sub-contractors performing any Work specified in this Section. List shall clearly identify the sub-contractor's legal name and address, the scope of work to be performed by the sub-contractor and the overall percentage of the Work being provided by the subcontractor. If there are no sub-contractors performing any Work, submit statement on company letterhead clearly indicating no sub-contractors will be performing any Work specified in this Section.
 - b. Advanced System Warranty – sample certificate
 - c. Bill-of-Materials
 - d. Product Data
 - e. Test Equipment Calibration documentation
 - f. Shop Drawings

1.8 PROJECT CLOSEOUT

A. Preliminary Project Closeout submittal:

1. Submit the following a minimum of two weeks before Substantial Completion:
 - a. Memo/letter indicating that the Structured Cabling Work is nearing completion and ready for the Final Site Observation by the Design Consultant.
 - b. Approved Shop Drawings or field Drawings with actual outlet locations and Cable IDs in PDF format. BIM/CAD-produced drawings converted to PDF format. Cable IDs shall match Test Reports. Provide 30"x42" laminated shop drawings, for each telecom room serving a given area.
 - c. For all Access Point Shop Drawings provide Overall Floor Plans with the following indicated:
 - 1) MAC Address
 - 2) Termination Port

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- 3) AP ID
 - d. Cable Test Reports, in both PDF and original tester format.
 - B. Final Project Closeout submittal for this Section shall include the following:
 - 1. Bill-of-Materials / Product Index – include column indicating any materials or equipment with a manufacturer’s warranty longer than one year.
 - 2. Product Data
 - 3. Operation and Maintenance Data
 - 4. Warranty Documentation
 - a. Provide Advanced System Warranty certificate from the manufacturer, which shall cover the performance and product warranty requirements of the Warranty paragraph above.
 - b. For any materials or equipment provided by the Contractor with a manufacturer’s warranty longer than one year, include manufacturer documentation.
 - 5. Test Results
 - 6. Training and Spare Parts
 - a. Signed acceptance letter or form indicated Owner has been properly trained in operation of the system and has taken possession of the specified Spare Parts and Tools (items listed as “Furnish to Owner”).
 - 7. Record Drawings (“As-Builts”)

1.9 COORDINATION

- A. Coordination with other Divisions and Sections
 - 1. Division 26 Electrical
 - a. Coordinate data outlet faceplate color to match adjacent wiring device (receptacle) faceplate. Coordinate exact color with Architect and Division 26 Contractor prior to Pre-Construction Submittals.
 - b. Coordinate Equipment Rack and Cabinet power requirements and locations with Division 26 Contractor.
 - c. Coordinate connection of Bonding Conductor for Telecommunications (BCT) from the electrical grounding system to the TMGB with Division 26 Contractor. Coordination of the telecommunications building wide grounding system with Division 26 Contractor.
 - 2. Section 27 41 00 Integrated Audiovisual Systems
 - a. As required by these specifications, furnish patch cords and station cords for data outlets supporting equipment. Coordinate with Division 27 41 00 Contractor on the development of Shop Drawings indicating pathways required for the Structured Cabling System.
 - 3. Section 27 51 23 Intercommunications Systems
 - a. As required by these specifications, furnish patch cords and station cords for data outlets supporting equipment. Coordinate with Division 27 51 23 Contractor on the development of Shop Drawings indicating pathways required for the Structured Cabling System.
 - 4. Section 28 10 00 Access Control System
 - a. As required by these specifications, furnish patch cords and station cords for data outlets supporting Access Control equipment. Coordinate exact locations with Division 28 10 00 Contractor on the development of Shop Drawings indicating pathways required for the Structured Cabling System.
 - 5. Section 28 20 00 Video Surveillance System

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- a. As required by these specifications, furnish patch cords and station cords for data outlets supporting Video Surveillance equipment. Coordinate exact locations with Division 28 20 00 Contractor on the development of Shop Drawings indicating pathways required for the Structured Cabling System.
- B. Preinstallation Meeting / Coordination with Owner
1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Design Consultant, and Owner regarding Work specified in this Section.
 2. This meeting is meant to:
 - a. Review Scope of work, schedule, and escalation procedures.
 - b. Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 3. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. For devices and equipment with no part number specified, submit product cutsheet for a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- B. For cabling and terminations, provide manufacturer documentation that certifies performance characteristics and compliance with ANSI/TIA 568 standards.

2.2 HORIZONTAL CABLING AND TERMINATIONS

- A. Horizontal Cabling – Typical
 1. Shall meet or exceed Category 6A requirements of TIA-568-2.D
 2. Shall be comprised of 4-pair, 23 AWG conductors with an unshielded jacket
 3. Plenum/CMP listed
 4. Color:
 - a. Data Cabling – Blue
 - b. Video Surveillance – White
 - c. Audiovisual – Green
 - d. Wireless - Orange
 5. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal
- B. In-Slab Horizontal Cabling
 1. Shall meet or exceed Category 6A requirements of TIA-568-2.D
 2. Shall be comprised of 4-pair, 23 AWG conductors with an unshielded jacket
 3. Shall be rated to be in-slab
 4. Plenum/CMP listed
 5. Color:
 - a. Data Cabling – Black

6. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

C. Horizontal Cabling – Jacks

1. Shall meet or exceed Category 6A requirements of TIA-5682.D
2. Shall accept 4-pair, 23 AWG conductors from a UTP cable
3. Front connection: female RJ45 / 8P8C
4. Jack Color on the Workstation Side:
 - a. Serving Workstations – Blue
 - b. Serving Access Points – Orange
 - c. Serving Audiovisual – Green
 - d. Serving Video Surveillance – White
5. Approved Manufacturers:
 - a. Panduit Minicom
 - b. Or Approved Equal

D. Copper Surge Suppression – Equipment Location

1. Single Port
2. Capable of 10GbE pass-through
3. Capable of up to 802.3bt Type 4 PoE
4. Shall comply with UL497B
5. Approved Manufacturers:
 - a. Ditek
 - b. Or Approved Equal

E. Copper Surge Suppression – Head-End Location

1. Minimum of 24-Ports
2. Capable of 10GbE pass-through
3. Capable of up to 802.3bt Type 4 PoE
4. Shall comply with UL497B
5. Approved Manufacturers:
 - a. Ditek
 - b. Or Approved Equal

2.3 HORIZONTAL COPPER TERMINATION

A. Wall Phone Faceplate

1. Shall have integral tabs for wall phone
2. Opening shall be recessed
3. Shall be Stainless Steel
4. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

B. Multi-Port Faceplate

1. Thermoplastic – color to match Division 26 Wiring Devices
2. Shall have a minimum of two-ports
3. Shall have integral ID Window
4. Shall accept Jack specified above

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5. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

 - C. Faceplate for Mechanical/Electrical/Plumbing/Other Support Spaces
 1. Polycarbonate
 2. Minimum of IP56 – Water Resistant
 3. Shall accept Jack specified above
 4. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

 - D. Decora-Style Mounting Frames
 1. Thermoplastic – color to match Division 26 Wiring Devices
 2. Shall accept Jack specified above
 3. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

 - E. 2-port Surface Mount Box
 1. Small thermoplastic box that will accept Jack specified above.
 2. Shall be plenum rated
 3. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

 - F. Blank Inserts
 1. To be populated into any unused jack openings in faceplates or surface mount boxes.
 2. Color shall match faceplate
 3. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

 - G. 24/48-Port Patch Panel:
 1. Modular
 2. Flat
 3. Steel construction
 4. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal
- 2.4 CABLES
- A. Copper Patch Cables – Head-End
 1. Horizontal Termination Locations - Audiovisual, Security, and Workstations
 - a. Shall have integral boot
 - b. Shall be Category 6A
 - c. Shall be 28AWG
 - d. Patch Cable Color:

- 1) Serving Workstations – Blue
- 2) Serving Access Points – Orange
- 3) Serving Audiovisual – Green
- 4) Serving Video Surveillance – White
- e. Approved Manufacturers:
 - 1) Panduit
 - 2) Or Approved Equal

B. Copper Station Cables – for Installation at Devices / Work Area Outlets

1. Horizontal Termination Locations - Audiovisual, Security, and Workstations
 - a. Shall have integral boot
 - b. Shall be Category 6A
 - c. Shall be 24AWG
 - d. Patch Cable Color:
 - 1) Serving Workstations – Blue
 - 2) Serving Access Points – Orange
 - 3) Serving Audiovisual – Green
 - 4) Serving Video Surveillance – White
 - e. Approved Manufacturers:
 - 1) Panduit
 - 2) Or Approved Equal

2.5 EQUIPMENT RACKS AND CABINETS

A. 84" Two-Post Equipment Rack

1. 19-inch wide, universal two-post rack
2. Aluminum or steel construction
3. #12/24 mounting holes (universal hole pattern)
4. Color: Black
5. Minimum Weight Capacity: 750 pounds
6. Height: 45RU
7. UL listed as a communications circuit accessory
8. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

B. Wireless Access Point Enclosure - Interior

1. Shall have a lockable door
2. Shall be capable of being installed in a standard 2x2 ceiling tile opening.
3. Shall include mounting accessories.
4. Approved Manufacturers:
 - a. Oberon 1077
 - b. Or Approved Equal

2.6 CABLE MANAGEMENT

A. Vertical Cable Managers

1. Shall be dual-sided
2. Shall be black

3. Shall have removable front and rear covers
4. Width
 - a. 6"
 - b. 10"
5. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

B. Horizontal cable managers

1. 2RU
2. Front and Back channel
3. Include front removable cover
4. Shall be black
5. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

2.7 LADDER RACK & ACCESSORIES

A. Ladder Rack

1. Minimum of 12" Width
2. Minimum rung spacing of 12"
3. UL listed as equipment grounding conductor
4. Provide manufacturer-specific accessories as needed to support installation requirements, such as:
 - a. Butt-Splice Kit
 - b. Junction Splice Kit
 - c. Butt-Swivel Splice Kit
 - d. Rack-to-Runway Mounting Kit
 - e. Triangular Support Bracket
 - f. Wall Angle Support Kit
 - g. 45-Degree / 90-Degree Runway Splice Kit
 - h. Vertical Wall Brackets
 - i. Threaded Ceiling Kit
 - j. Threaded Rod Cover
 - k. Protective End Caps
 - l. End Closing Kit
5. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

B. Radius Drop

1. Minimum of 3" Bend Radius
2. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

C. Elevation Kit

1. Minimum of 6" Elevation Kit
2. Shall include top-plate

3. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

2.8 RACK-MOUNTED POWER EQUIPMENT

A. Vertical Power Distribution Unit – 20A

1. Shall operate at 208V with 20A capacity, with (2) L5-20P Connections
2. Shall have built-in surge suppression
3. Shall include a minimum of (32) 5-15/20R inputs
4. Shall provide with stand-off mounting brackets
5. Shall have power monitoring and communication through LAN port with the following features:
 - a. Branch/phase monitoring of voltage, current, power, and power factor
 - b. Local LCD screen
 - c. Network access for remote monitoring (IPv4 and IPv6)
 - d. Built-in Web Interface and GUI
 - e. Email notification
 - f. Event and data logging
6. Approved Manufacturers:
 - a. Vertiv
 - b. Eaton
 - c. APC
 - d. Or Approved Equal

B. Uninterrupted Power Supply – 30A

1. Shall operate at 208V with 30A capacity.
2. Shall have built-in surge suppression.
3. Shall include a minimum of (6) 5-15/20R, (1) L6-30R outputs and (1) L6-30P input.
4. Shall have a rated capacity of 3000kVA.
5. Shall have a minimum runtime of 30 minutes assuming 1200-watt load.
6. Shall have power monitoring and communication through LAN port with the following features:
 - a. Branch/phase monitoring of voltage, current, power, and power factor
 - b. Local LCD screen
 - c. Network access for remote monitoring (IPv4 and IPv6)
 - d. Built-in GUI
 - e. Event and data logging
7. Approved Manufacturers:
 - a. Vertiv
 - b. Eaton
 - c. APC
 - d. Or Approved Equal

2.9 LABELING

A. Cable Labeling

1. For Horizontal Cables and Inside-Plant Backbone Cables
 - a. Laser/Ink Jet Self Laminating Labels
 - b. Approved Manufacturers:

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- 1) Panduit – S100X Series
 - 2) Brady
 - 3) Dymo
 - 4) Or Approved Equal
2. For Outside-Plant Backbone Cables and Innerduct
 - a. Self-laminating cable marker tag, tie on (with zip ties)
 - b. Approved Manufacturers:
 - 1) Fiber Optic – Panduit PST-FO, Mooseline F1-0095
 - 2) Copper – Mooseline F1-0095
- B. Rack and Patch Panel Labeling
1. Vinyl cloth label
 2. Lettering/numbering text height 3/8" to 1/2"
 3. Approved Manufacturers:
 - a. Brady PTL series
 - b. Panduit PCL037 series
 - c. Or Approved Equal
- 2.10 PLYWOOD BACKBOARD
- A. Flame Retardant
 - B. Minimum AC grade plywood
 - C. 8' tall by 4' wide by 3/4" thick
 - D. Painted with two-coats of fire-retardant white paint
- 2.11 TESTING EQUIPMENT
- A. Optical Loss Test Set (OLTS)
 - B. OTDR Tester
 - C. Copper Tester
 1. Level IV accuracy
 2. Approved Manufacturers:
 - a. Fluke – designer to insert part number and calibration
 - b. Ideal Networks – designer to insert part number and calibration
 - c. Or Approved Equal
 - D. Grounding/Bonding Tester
 1. Earth Ground Resistance Tester – configured for a continuity / two-point test
 2. Approved Manufacturers:
 - a. Fluke
 - b. Greenlee
 - c. Ideal
 - d. Or Approved Equal

2.12 TELECOM GROUNDING AND BONDING

A. TMGB (Telecommunications Main Grounding Busbar)

1. Tin plated Copper construction to prevent corrosion
2. Size: 4" x 20" x 1/4"
3. UL 467 Listed
4. TIA-607-hole pattern (pairs of lugs at 5/8" hole centers and 1" hole centers)
5. Part of kit that includes busbar, two insulators, two steel stand-off brackets, and mounting accessories
6. Approved Manufacturers:
 - 1) Panduit
 - 2) Harger
 - 3) Or Approved Equal

B. Two-Hole Lugs

1. UL listed
2. Two-hole, long barrel, electro tin-plated compression lug with inspection port
3. Approved Manufacturers:
 - a. Panduit
 - b. Harger
 - c. Or Approved Equal

C. Conductors

1. Minimum conductor size shall be #6 AWG, sized based on length per Table on Drawings
2. Insulation shall be rated for the environment where it is installed
3. Approved Manufacturers:
 - a. Panduit
 - b. Harger
 - c. Or Approved Equal

D. Conduit Clamps

1. Tinned copper with 1-1/2-inches of contact area.
2. Can be connected to conductors via exothermic connection or standard compression lugs.
3. Approved Manufacturers:
 - a. Panduit
 - b. Harger
 - c. Or Approved Equal

E. Cable to Cable Connections

1. T-tap or Exothermic Weld
2. Approved Manufacturers:
 - a. Panduit StructuredGround Direct Burial Compression Grounding System
 - b. Harger RT series (T-tap) or UltraShot Weld Metal (Exothermic Weld)
 - c. Or Approved Equal

F. Cable to Structural Steel Connections

1. Exothermic Weld
2. Approved Manufacturers:

- a. Panduit Structured Ground Direct Burial Compression Grounding System
- b. Harger – Ultraweld series
- c. Or Approved Equal

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Labeling Scheme

1. Coordinate with Owner to develop TIA-606 standard-compliant cable and Outlet ID labeling scheme for the Project.
2. Labeling for cabling for Video Surveillance Cameras
 - a. Cable labels shall contain the device number as indicated in the technology drawings, wire origin room number, wire destination room number, and wire type (i.e., C01/122-210/CAT6A). In instances where no origin room number exists, utilize the device number as indicated in the technology drawings, wire destination room number, and wire type (i.e., C01/210/CAT6A).
3. Indicate proposed cable and Outlet ID identifiers on the Shop Drawings.

3.2 GENERAL CABLE INSTALLATION REQUIREMENTS

- A. Test all cables prior to installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.
- B. Cables shall be properly supported in accordance with the Contract Documents, NEC, and industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
- C. Outside of Communications Rooms & Enclosures, cables shall be installed in the following manner:
 1. Within continuous concealed or underground conduit.
 2. Within cable tray.
 3. Supported by J-hooks above accessible ceiling at the following locations/intervals:
 - a. J-hooks shall be independently supported to structure and shall not utilize grid wire.
 - b. J-hooks shall be furnished with closure clips.
 - c. J-hooks shall be provided every 3-feet to 5-feet and at every change in direction or elevation.
 - d. Maximum sag between supports shall be 12-inches.
 - e. No higher than 3-feet above accessible ceiling.
 - f. Neatly bundle and wrap cables with Hook and Loop Straps at ten-foot intervals.
- D. Cables routed in conduit shall have a maximum fill ratio of 40%.
- E. Cables routed in cable tray shall have a maximum fill ratio of 50%.
- F. Cables shall be routed parallel and perpendicular to building structure, except where specifically noted on the Drawings.

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- G. All cable / cabling shall be kept 30 inches away from any heat source, i.e. steam valves, etc. All cables/cabling shall be kept away from moveable mechanical equipment: i.e., dampers, valves, pneumatic tubes, etc. -- thirty (30) inches.
 - H. Data wiring must be at least: Five (5) inches from power lines 2kVA or less, Twelve (12) inches from fluorescent lighting and power lines 2 and 5kVA, Thirty-six (36) inches from power lines greater than 5kVA, Forty (40) inches from transformers and motors.
 - I. Where High Voltage is present in interstitial space, cables shall be kept away from the conduits as far as possible. Where possible, cables must cross AC power at 90-degree angles.
 - J. Cables shall be pulled free of sharp bends or kinks. Cables shall not be pulled across sharp edges. Cables shall not be forced or jammed between metal parts, assemblies, etc.
 - K. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
 - L. Cables shall not be routed in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be temporarily removed and reinstalled after nylon bushings are installed, without additional cost to the Owner.
 - M. Cables shall be installed continuous, with no splices – except where specifically indicated on the Drawings.
 - N. Cables shall be installed without kinks, paint, or other visible sign of damage. Replace cables damaged during installation or construction without additional costs to the owner.
 - 1. Painted cables are not allowed, even with passing test results. Replace all painted cables without additional costs to the owner.
 - O. Use of zip / nylon cable ties to bundle or support cable is prohibited.
 - P. For all cabling routing within the slab on the first floor, provide in-slab cabling, as specified.

3.3 HORIZONTAL CABLE INSTALLATION REQUIREMENTS

- A. No horizontal cable shall be longer than two hundred ninety-five (295) feet. If any horizontal cable will be longer than two hundred ninety-five (295) feet, Contractor shall stop installation of the cable and immediately notify Architect/Design Consultant in writing. If Contractor fails to notify the Architect/Design Consultant in writing, Contractor shall replace cable at no cost to the Owner.
- B. Provide horizontal cables within each serving area from the respective Communications Room/Enclosure to each outlet location as indicated on the Drawings.
- C. Provide a 10-foot service loop of horizontal cable bundles in each Communications Room/Enclosure, to be neatly stored in overhead ladder rack.
- D. Provide an 8-foot service loop of each horizontal cable coiled and supported on J-hook equipment side of the permanent link or where conduit from outlet stubs into nearest accessible ceiling space.

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- E. Provide 6" to 12" of cable slack in each backbox, where possible. Cover/mask each outlet box prior to painting.
 - F. Terminate cables with TIA 568-B sequence.
 - G. Provide in-line surge suppression at exterior devices (such as cameras and wireless access points) that are susceptible to lightning strikes (outside the building's "Zone of Protection").
 - H. For all above ceiling terminated data outlet locations provide black grid label, with white lettering directly below, label to match cable ID.
 - I. For Ceiling wireless access points located in group room 153 and Social 138, a lockable ceiling enclosure to be provided as specified.

3.4 FACEPLATE INSTALLATION REQUIREMENTS

- A. Provide faceplates, systems furniture faceplates, decora style inserts, or surface-mounted boxes to house jacks as indicated in the Drawings.
- B. Coordinate color of faceplate prior to Submittals. Color shall match adjacent electrical devices.
- C. Install faceplates level and plum (bottom parallel to floor/countertop). Remove protective film after installation.
- D. Install faceplate label with Cable ID that matches Record Drawings and Test Results.
- E. Fill any unused jack openings with blank inserts.
- F. Properly protect information outlets from damage by other trades during construction. Correct any damaged or painted outlets at no cost to the Owner.

3.5 COMMUNICATION ROOM BUILD-OUT INSTALLATION REQUIREMENTS

- A. Material and equipment shown on Enlarged Communications Plans, Enlarged Reflected Ceiling Plans, and Wall and Rack Elevation Details are diagrammatic. At a minimum, provide quantity of racks, patch panels, and cable managers as shown on the Drawings. Provide actual quantity of material and equipment required to support total number cable terminations.
- B. Line walls with plywood backboard as indicated on the Drawings. Install bottom of backboard at 24-inches above finished floor.
 - 1. Cover the plywood with two coats of fire-retardant paint, leaving exposed one fire rating stamp per sheet.
- C. Equipment Racks and Cabinets
 - 1. Provide equipment racks with vertical management using manufacturer approved hardware and installation methods as indicated in the Drawings.
 - 2. Secure relay racks to the concrete floor utilizing expandable concrete anchors.
 - 3. Secure the equipment racks to the cable runway using cable runway elevation kits and manufacturer approved hardware and installation methods.
 - 4. Bolt equipment racks and vertical cable managers together.

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5. Individually bond each equipment rack to bus bar in the Communications Room/Enclosure and ensure metal-to-metal contact.
 6. Each rack/cabinet shall be equipped with a label at the top, front and back, with text a minimum of 3/8" tall, indicating the rack/cabinet number.
 7. Each patch panel shall be equipped with a label in the middle or left side with text a minimum of 3/8" tall, indicating the patch panel number/designator.
- D. Ladder Rack & Installation
1. All ladder rack shall be installed as shown on the T-Sheet Enlarged Room Plans
 2. For every horizontal/vertical penetration into a Communications Room/Enclosure, provide vertical ladder rack with vertical standoff brackets from the point of termination to the point of horizontal transition.
 3. Each location where a 90-degree intersection occurs, provide butt-splice kit.
 4. Each location where a ladder rack crosses the top of a rack/cabinet, provide elevation kit.
 5. Each location where a continuous run of ladder rack extends further than 10-feet, provide junction splice kits.
 - a. Each location where the continuous run extends past 15-feet without connection to rack or wall, provide 3/8" all-thread support from structure.
 6. Ladder rack pieces shall be bonded per the TIA.
- E. Horizontal Cables shall be bundled together by color with Hook and Loop Straps every 24-inches.
- F. Cables routed vertically within the Communications Room/Enclosure shall be attached to vertically mounted ladder rack with Hook and Loop Strap every 4-feet or less. If vertical ladder rack is not provided, provide 4" D-ring every 4-feet and attach cabling to it with Hook and Loop Strap.
- G. Horizontal Cables serving all termination locations shall be terminated in their own dedicated patch panel(s). These cables shall be bundled together with Hook and Loop Straps as they are routed through the Communications Room/Enclosure. Provide with 10% future growth.
- H. Horizontal Cables serving Wireless Access Points shall be terminated in their own dedicated patch panel(s). These cables shall be bundled together with Hook and Loop Straps as they are routed through the Communications Room/Enclosure. Provide with 10% future growth.
- I. Horizontal Cables serving Video Surveillance Cameras shall be terminated in their own dedicated patch panel(s). These cables shall be bundled together with Hook and Loop Straps as they are routed through the Communications Room/Enclosure. Furnish patch and station cables to Division 282000 Contractor.
- J. Horizontal Cables serving site cameras and other devices subject to lightning strikes (outside the building's Zone of Protection) shall terminate to Building Entrance Protectors. For four cables and less, provide wall-mounted Building Entrance Protectors. For five or more cables, provide rack-mounted Building Entrance Protectors. Provide machine-printed label on protector for each port with Cable ID number. Bond each protector to TMGB/TGB.
- K. Head-End Support Accessories
1. Provide Vertical Wire Managers, as shown on Enlarged Plans.
 2. Provide a minimum of (2) two horizontal-wire managers, per provided rack.
 3. Provide (2) two vertical mounted PDUs, per provided rack.
 4. Provide a minimum of (1) 30A UPS, per provided rack.

5. For each telecommunications room provide a rack-mounted surge protection patch panel, for all cabling serving external devices.
 - a. Quantity of modules to match quantity of devices, plus 10%.

- L. All Communication Room patch cords provided, shall be patched in by the providing contractor. Provide patch mapping from the patch panel to the corresponding switch. PDF of all port mapping shall be provided to the Owner, once completed.

3.6 PATCH CABLE REQUIREMENTS

A. Copper Patch Cables – Head-End

1. Horizontal Termination Locations -
 - a. Furnish one Category 6A patch cable in original packaging to Owner for 100% of the terminated ports in each Communications Room/Enclosure
 - b. Lengths:
 - 1) 25% of these patch cables shall be 5-feet in length
 - 2) 25% of these patch cables shall be 7-feet in length
 - 3) 50% of these patch cables shall be 10-feet in length

B. Copper Station Cables –

1. Horizontal Termination Locations -
 - a. Furnish one Category 6A patch cable in original packaging to Owner for 100% of the terminated ports at each outlet location
 - b. Lengths:
 - 1) 25% of these patch cables shall be 5-feet in length
 - 2) 25% of these patch cables shall be 7-feet in length
 - 3) 50% of these patch cables shall be 10-feet in length

3.7 OWNER PROVIDED EQUIPMENT INSTALLATION REQUIREMENTS

- A. All shown wireless access point locations shall be provided by Owner and installed by contractor. All labor to mount shall be part of the base contract. Locations to be verified with Owner prior to installation completion.
- B. A quarter-inch label shall be placed on the face of each wireless access point. Label to be provided by contractor with coordination of naming convention from Owner.
- C. Any wireless access point that is installed within open ceiling shall have a provided junction box and conduit from the nearest non-continuous pathway.
- D. Any wireless access point that is installed within hard-lid ceiling shall have a provided junction box and conduit from the nearest accessible ceiling.

3.8 GROUNDING AND BONDING INSTALLATION REQUIREMENTS

A. General Requirements:

1. Ensure metal-to-metal contact for all terminations.
2. All materials shall be UL Listed.

3. Cable-to-cable connections and cable-to-building steel connections shall be exothermic welds. All other connections shall be made with UL Listed compression 2-hole lugs with anti-oxidation compound, utilizing both lug openings.
4. Only one lug shall occupy a hole on the busbar. No stacking lugs or “double lugging” shall be permitted.
5. Bonding conductors shall be sized based on length per BICSI Standards; minimum size #6 AWG and maximum size 750kcmil. See chart below for Sizing Requirements:

TBB/BBC Linear Length m (ft)	Conductor Size (AWG)
Less than 4 (13)	6
4 - 6 (14 - 20)	4
6 - 8 (21 - 26)	3
8 - 10 (27 - 33)	2
10 - 13 (34 - 41)	1
13 - 16 (42 - 52)	1/0
16 - 20 (53 - 66)	2/0
20 - 26 (67 - 84)	3/0
26 - 32 (85 - 105)	4/0
32 - 38 (106 - 125)	250 kcmil
38 - 46 (126 - 150)	300 kcmil
46 - 53 (151 - 175)	350 kcmil
53 - 76 (176 - 250)	500 kcmil
76 - 91 (251 - 300)	600 kcmil
Greater than 91 (301)	750 kcmil

B. Dedicated Telecom Bonding System – Compliant with TIA-607

1. Provide a dedicated Telecommunications Bonding Backbone to each IDF, fully compliant with the TIA-607 standard.
 - a. Where the Communications Rooms are stacked the TBB shall be continuous to the uppermost Communications Room. “T” taps shall be used to tie TGBs on floors between the TMGB and the uppermost TGB.
 - b. Conductor shall be sized from the TMGB to the uppermost TGB and each conductor between a “T” tap and the TGB shall be the same size as the TBB it is fed from.
 - c. For buildings that are taller than two stories, provide a Grounding Equalizer conductor interconnecting multiple TBBs on the top floor and every 3rd floor between.

C. Telecom Bonding System to Building Steel – Compliant with TIA-607

1. In a metal frame building where structural steel is properly bonded to the AC Grounding Electrode System, a Telecommunications Bonding Backbone is not required. The TMGB shall be bonded to the Electrical Ground System via a Bonding Conductor for Telecommunications, as well as to nearest available structural steel. TGBs shall be bonded to the nearest available structural steel. These locations shall be readily accessible and clearly indicated on Record Drawings.

D. Main Communication Room (MDF)

1. Install TMGB at 48-inches above finished floor.
2. Bonding Conductor for Telecommunications (BCT)
 - a. Division 26 Contractor shall provide Bonding Conductor for Telecommunications from the Electrical Ground System to the TMGB.
 - b. BCT conductor size shall be sized based on length per the table on the Drawings and shall be no smaller than the largest TBB conductor. If installed underground, install in dedicated 2-inch diameter conduit.
3. Provide bonding conductors to the following equipment within the Communication Room (where available/installed):
 - a. Structural steel or support beams located within the room.
 - b. If electrical distribution panelboard serving the Communications Room/Enclosure is located within the Communications Room/Enclosure, bond TGB to ground bus of the panelboard.
 - c. Overhead ladder rack
 - d. Equipment racks, cabinets, and enclosures
 - e. Surge protectors / building entrance terminals
 - f. Exposed cable shields
 - g. Continuous metallic conduits for low voltage cabling that stub into the Communication Room
 - h. Any additional equipment or pathways where bonding/grounding is recommended by the equipment manufacturer or the referenced standards (TIA 607 and NECA/BICSI 607).

3.9 LABELING

- A. Contractor shall verify room numbers and confirm the final room numbering scheme prior to generating any labels.
- B. Horizontal Cables shall be labeled within (12) inches from the termination point inside the Communications Room/Enclosure.
- C. Horizontal Cables shall be labeled within (6) inches from the termination point at the workstation end.
- D. Backbone Fiber and Copper Cables shall be labeled within (12) inches of the visible end of the jacket and at each pull point location. If passing through a Communications Room/Enclosure it will be labeled when entering and leaving that Communications Room/Enclosure.
- E. Fiber Innerduct shall be labeled within (12) inches of the point of entry of the fiber optic enclosure and at each pull point location. If passing through a Communications Room/Enclosure it will be labeled when entering and leaving that Communications Room/Enclosure.
- F. Bonding conductors shall be labeled within (12) inches from their termination point.

-
- G. Cables shall be labeled identically at both ends.
- H. Equipment Racks
1. Equipment racks in each Communications Room shall be labeled in sequential numeric order.
 - a. Labels shall be centered on the top front of the equipment rack.
- I. Cabinets
1. Cabinets in each Communications Room/Enclosure shall be labeled in sequential numeric order.
 - a. Labels shall be centered on the top front of the Cabinet.
- J. Fiber Optic Enclosures
1. Fiber optic enclosures shall be labeled alpha-numeric starting with the 1st fiber optic enclosure in the top of the 1st equipment rack.
 2. A label for each terminated strand shall be securely placed inside each fiber optic enclosure.
- K. Backbone Cable
1. Fiber Optic Cable
 - a. Fiber optic backbone cable labels shall contain the cable origin room number, the cable destination room number, fiber strand numbers, and type (i.e., B126-A118/001-012MM).
 - 1)
 - b. Fiber optic couplers panels in fiber enclosures shall be labeled at each end by strand denoting building code, Equipment Room and/or Telecommunications Room, enclosure number, and strand number to and from respectively (i.e., B126/01/01-12 – A118/01/01-12).
 2. High Pair Count Copper Cable
 - a. For high pair count copper backbone cables, the label scheme shall contain, cable origin room number, the cable destination room number, and cable pairs (i.e., B126-A118/001-025).
 - b. 110-type blocks shall contain the destination room number, pair numbers, and binder pair number under each pair termination. (example)
 - c. 110-type block labels shall be printed on product-specific label strips and placed into label holders.
- L. Horizontal Cable
1. Inside Equipment Rooms
 - a. Horizontal cables shall be labeled at each end with the destination end and origin room number, patch panel number, and port number. (i.e., B126-B127-A01).
 - 1) All room numbering to be done with final architectural numbers, coordinate prior to final labeling.
 - b. Patch panels in each closet shall be labeled sequentially starting with the first Patch Panel in the top of the first relay rack (A, B, C, D, E, etc.).
 - 1) All room numbering to be done with final architectural numbers, coordinate prior to final labeling.

- c. All patch panels will indicate the room number along with the patch panel port designation. The labels shall be mechanical labels that are neatly printed with uniform font and evenly spaced across the patch panel. Room numbers will be in sequential order throughout the panels as indicated on the drawings.
 - 1) All room numbering to be done with final architectural numbers, coordinate prior to final labeling.

M. Workstation Faceplates

- 1. Cables and wall plates shall be labeled denoting origin, Communications Room/Enclosure Room Number, Patch Panel, 110-type termination block, and Port Number. (i.e., B127-A01).

N. TMGB

- 1. TMGB shall be labeled with a unique identifier (i.e., TMGB-B126, TGB-A118).

O. Bonding Conductors

- 1. The following conductors shall be labeled at each end with the destination end and origin room number (i.e., B126 – IDFA118).
 - a. Bonding Conductor for Telecommunications
 - b. Telecommunications Bonding Backbone
 - c. Grounding Equalizer

3.10 FUNCTIONAL AND PERFORMANCE TESTING

A. The following additional testing requirements shall be provided:

- 1. Category Cable Testing
 - a. Cable links shall be tested in accordance with industry standards.
 - b. Only Manufacturer Certified Technicians shall perform testing.
 - c. Test and certify the structured cable system with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with non-approved test equipment or tester(s) that are not within their calibration period.
 - d. No Fail or *Pass results will be accepted.
 - e. Notify the Architect/Design Consultant a minimum of five (5) days in advance to observe field testing.
 - f. The Architect/Design Consultant may randomly select 5% of the installed links for test verification purposes. The Contractor shall re-test these links in the presence of the Architect/ Design Consultant and the results shall be compared to the previously Contractor submitted test results. In the event that any of the verification tests differ in results from the previously submitted test results, all testing shall be declared a failure and the Contractor shall re-test 100% of the installed links at no cost to the Owner.
- 2. Grounding and Bonding
 - a. Main Building Ground
 - 1) Coordinate with electrical contractor and provide a copy of their test results for the main building ground. The results shall be below 25 Ohms.
 - b. Two-Point Ground/Continuity Testing
 - 1) Prior to the two-point ground testing, a visual inspection shall be performed to verify that the bonding and grounding system is installed according to the drawings and specifications and in compliance with the TIA-607 Standard.

- 2) All testing shall be conducted prior to any active equipment is installed.
 - 3) Utilize an earth ground resistance tester that is configured for a continuity test. This is also known as a two-point tester or a “dead earth” test.
 - 4) Prior to the two-point continuity test conduct a voltage test to ensure there is no stray voltage in the system.
 - 5) The testing shall include but is not limited to the following points.
 - a) Building electrical grounding electrode and the TMGB.
 - b) TMGB/TGB to electrical ground in each Communications Room.
 - c) TMGB/TGB to the building steel (if present).
 - d) TMGB to each TGB.
 - e) Building steel (if present) to the electrical ground.
 - 6) Per TIA-607, the maximum value for resistance between any point in the telecommunications bonding and grounding system and the building’s electrical grounding electrode system is 100 milliohms. In the case of long TBB and Grounding Equalizer conductor runs, the resistance of the conductor must be factored into the total resistance. For example, 1 km of a No. 3/0 conductor has a resistance of 0.2028 ohms. (0.06180 ohms per 1000 ft.)
 - 7) The Contractor shall notify the Architect/Design Consultant a minimum of five (5) days in advance to observe field testing.
3. Test Documentation
- a. Test Results shall be provided in both PDF and original tester format.
 - b. Test Results shall be organized in the following main sections, and alphabetically by Communications Room name/number and then alphabetically Cable ID within each section:
 - 1) Tester(s) Calibration Certificate(s)
 - 2) Inter-Building Backbone Fiber Optic Cable
 - 3) Inter-Building Backbone Copper Cable
 - 4) Intra-Building Backbone Fiber Optic Cable
 - 5) Intra-Building Backbone Count Copper
 - 6) Horizontal Category 3 Cable
 - 7) Horizontal Category 5e Cable
 - 8) Horizontal Category 6 Cable
 - 9) Horizontal Category 6A Cable
 - 10) Main Building Ground
 - 11) Two-Point Ground/Continuity Test for the TMGB and then each TGB.

3.11 FIELD OBSERVATIONS

- A. Prior to the Final Site Observation by the Consultant, submit the Preliminary Project Closeout documentation. Refer to Part 1 of this Section for requirements.

3.12 DEMONSTRATION, TRAINING, AND ADJUSTMENTS

- A. At the time of Owner Training, furnish the following to the Owner:
 1. Patch Cords
 2. Station Cords
 3. Termination tool
 4. Paper copy of O&M (Operation and Maintenance) manuals and associated warranty information supplied for each type of equipment. Place each copy into a plastic sleeve in a three-ring binder; do not provide duplicates unless there is a serial number.

END OF SECTION 27 10 00

SECTION 27 41 00

INTEGRATED AUDIOVISUAL SYSTEM(S)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section, and the associated AV-Drawings and Contract Documents, identify the requirements, technical design, and specifications for the Audiovisual System(s) at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. Contractor shall include materials, equipment, and labor necessary to provide a complete and functional Audiovisual System(s) regardless of any items not listed or described in this specification or associated drawings.
- C. Provide complete, turn-key Audiovisual System(s), including all equipment, mounting hardware. and associated cabling for the following room types.
 - 1. Consultation Room(s)
 - 2. Group Room(s)
 - 3. Public Viewing Area(s)
 - 4. Staff Lounge
 - 5. Family Visit Room

1.2 RELATED REQUIREMENTS

- A. The Contractor shall examine all of the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Contractor Experience Requirements
 - 1. The Contractor shall possess all relevant Manufacturer Certifications for both the company and individual technicians prior to submitting a bid for the work. These shall include:
 - a. Control and AV Distribution
 - 2. The Contractor's Project Manager shall have a minimum of (5) five years' experience installing and/or project management experience for Audiovisual Systems. This Project Manager shall be available for all onsite coordination meetings.
 - 3. The Contractor shall have been in business for a minimum of five (5) years.
 - 4. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
 - 5. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
- C. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.3 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 0 and 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for Electrical System requirements.

1.4 CONFIDENTIALITY

- A. Limit access to physical and electronic versions of these Division 27 specifications and associated Drawings to individuals directly involved in performing the Work.
- B. Pursuant to Texas Statute 418.182, certain portions of Division 27 specifications and associated drawings relate “to the specifications, operating procedures, or location of security systems used to protect public or private property from an act of terrorism or related criminal activity” and as such are confidential.

1.5 SUBMITTAL REQUIREMENTS

- A. Pre-Installation Submittal
 - 1. General requirements:
 - a. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Design Consultant.
 - b. Contractor shall ensure submittals are submitted in a timely manner to ensure all products can be ordered and received on site in order to not cause any delays. If there are any concerns with any products having long lead times, those products shall be clearly identified in writing so the review and approval can be expedited.
 - c. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
 - 2. Contractor Qualifications:
 - a. Manufacturer Product Certifications.
 - b. Manufacturer Installer Product Certifications.
 - c. Manufacturer Certifications for testing equipment technicians.
 - d. Manufacturer Certifications for testing equipment calibration.
 - e. Documentation indicating that Contractor has been in business for (5) years.
 - f. Address of Contractor’s local office within a one-hundred-mile radius of the project site.
 - g. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.
 - h. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

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- i. List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.
 3. Bill-of-Materials / Equipment List
 4. Product Cutsheets
 - a. Submit Product Data / Cutsheets only. Do not submit a user or operator's manual in lieu of a specification sheet. If a specification sheet is not available from the manufacturer, submit a catalog page or the specification appendix (only) from the operation manual. The last resort acceptable submittal is a pdf of the specification section of the product from the manufacturer's website.
 - b. Product data must be in the same order as listed in the specification.
 5. Shop Drawings
 - a. General Requirements:
 - 1) Shop drawings shall be provided clearly depicting any proposed modification to the project drawings. Any modifications shall be highlighted on the shop drawings.
 - b. Shop drawings shall include system line diagrams, floor plans (include projector installed distance from screen with dimensioned distance), rack elevations, and/or detail drawings of sufficient quality to convey understanding and specific installation requirements of the Project.
 6. Custom Programmed Control System Submittal
 - a. Provide the control system submittal prior to initiating any substantial programming work and/or production of custom produced keys/labeling. Do not proceed with custom work until the proposed work product is approved in writing.
 - b. Proposed touch panel/keypad control layouts for each room/panel.
 - 1) Initial touch panel/keypad control layouts will be required for each room/panel as part of the product submissions.
 - 2) Contractor will design and modify control interface(s) based on Owner feedback. Contractor shall participate in an initial control system kick-off meeting along with progress meetings to review control system layout and design with the owner to ensure the control system fully meets the Owner's needs and expectations.
 - 3) Contractor shall fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology and final results.
 - 4) Contractor will also be expected to make reasonable adjustments to completed control systems based on Owner feedback once system is in use.
 - 5) Once initial system programming is implemented; allow owner a two-month period to utilize the system and make comments.
 - 6) After initial evaluation period coordinate with Owner. Record Owner's feedback and provide adjustments as requested.
 7. Shop drawings shall be made available for inspection at the request of the Design Consultant.
- B. Project Closeout Submittal

1. The Contractor shall provide comprehensive drawings accurately depicting the “as-built” condition of the Audiovisual systems as it was installed to the Owner/Consultant at the time of substantial completion. Final payment will not be made until these as-built documents are received and approved by the Owner/Consultant.
 - a. As-built drawings must be provided in digital format on a USB flash drive, other memory device(s) and/or delivered electronically.
2. Documentation shall include but not be limited to:
 - a. Equipment O & M manuals
 - b. Installed equipment list (manufacturer model numbers, serial numbers, installed locations, etc.)
 - c. Configuration information in Microsoft Excel format (IP addresses, Passwords and Usernames etc.)
 - d. Warranty support information
 - e. Documentation shall be bound, sectioned, and tabbed in the following order (when applicable)
 - f. Equipment O&M Manuals (Bound Separately)
 - g. Installed Equipment List
 - h. Configuration Information
 - i. Warranty Support Information
3. All custom programming files (control systems, audio DSP’s etc.) shall be delivered to the Owner. The Programmer shall transfer all source code/files related to the system. All programming shall be delivered in both compiled and un-compiled form. Upon system acceptance, ownership of the programmed system files shall be transferred to the Owner for their future use or modification. No claim shall be made by the programmer for continued licensing or other ongoing fees for continued usage of the system(s).

1.6 COORDINATION

A. Preinstallation Meeting / Coordination with Owner

1. After Bid and before Preconstruction Submittals, request a Pre-installation Meeting with Design Consultant and Owner regarding Work specified in this Section.
2. This meeting is meant to establish Owner’s preferences and expectations and provide direction for items noted as “Coordinate with Owner”.
3. Any derivations from the specified product shall be accounted for in a pre-submittal meeting and reviewed with the Owner prior to purchase.
4. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The following sections specifically list the acceptable equipment types and items for this project.
- B. Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.
- C. Proposed equivalent items must be approved in writing by the Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

- D. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.
- E. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.
- F. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- G. All wiring, equipment, and installation materials shall be new and of the highest quality.
- H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.
- I. Contractor shall provide the most current version of the specified product, at no additional cost to the Owner. The most current version shall meet the performance requirements of the current product, anything less than will not be accepted.
- J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Design Consultant prior to submitting a proposal for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as required.

2.2 DISPLAY DEVICES

- A. Attached equipment list is representative of the basis of design, all manufacturer's listed below and approved through the requested process, shall be consider an "Or Equal".
- B. Flat Panel Display(s) –Commercial Grade
 - 1. Commercial Grade
 - 2. Minimum of 24/7 Operation
 - 3. Minimum resolution 2160P with 400 nit
 - 4. Minimum of (2) HDMI and (1) RS-232 inputs
 - 5. Size: per Drawings
 - 6. Minimum 3-year Manufacturer Warranty
 - 7. Approved Manufacturers:
 - a. Samsung
 - b. LG
 - c. Panasonic
 - d. Or Approved Equal

2.3 DISPLAY DEVICE MOUNTING AND ACCESSORIES

- A. Tilting Wall Mount
 - 1. Maximum of 2.2" extension off of wall
 - 2. Shall support up to 200lbs
 - 3. Shall have native tilt of at least 15°
 - 4. Accessories

-
- a. Mounting Shelf – Minimum of 9" x 12"
 5. Approved Manufacturers:
 - a. Chief
 - b. Peerless
 - c. Crimson AV
 - d. Or Approved Equal

2.4 SOURCE DEVICES

A. Wireless Screen Sharing

1. Shall have a minimum resolution of 1080P
2. Shall have a minimum on (1) HDMI Output
3. Shall be capable of dual network connections
4. Shall connect wireless to a source device
5. Shall be capable of USB conference equipment sharing
6. Approved Manufacturers:
 - a. Mersive
 - b. Barco
 - c. Or Approved Equal

2.5 VIDEO CONFERENCING EQUIPMENT

A. Video Conferencing Soundbar – Consult

1. Shall have a minimum microphone pickup range of 23-feet
2. Shall be PTZ capable, with a minimum of 12x optical zoom
3. Shall have native VC appliance capabilities
4. Shall allow for wall or ceiling mount
5. Approved Manufacturers:
 - a. Logitech Rally Bar Huddle
 - b. Bose
 - c. Or Approved Equal

2.6 AUDIO SYSTEMS

A. Amplifier

1. Shall have minimum of 80W, at 70V when bridged
2. Shall have integral Commercial Mixer
3. Shall be Class D
4. Shall have native limiter
5. Approved Manufacturers:
 - a. JBL CSMA Series
 - b. QSC
 - c. Biamp
 - d. Or Approved Equal

B. Ceiling Recessed Speakers – S6

1. Minimum frequency response of 65 Hz-20 kHz
2. Maximum conical coverage of 135-degrees
3. Integral 70V transformer
4. Shall be ceiling tile replacement

5. Minimum taps of 60W, 30W, & 15W
6. Approved Manufacturers:
 - a. Bogen
 - b. JBL
 - c. QSC
 - d. Community
 - e. Or Approved Equal

C. Volume Controllers

1. Color shall matching electrical faceplates
2. Shall be wall plate
3. Shall natively connect to the amplifier
4. Shall allow for increment changes of 3dB
5. Approved Manufacturers:
 - a. JBL
 - b. Atlas Sound
 - c. Or Approved Equal

2.7 BULK CABLE AND CONNECTORS

A. Category 6A Cable – Typical

1. Unshielded, 4-pair, 23AWG cable designed to meet or exceed the TIA-568 standard for Category 6A applications and IEEE 802.3 Type 4 Power-over-Ethernet.
2. Approved for point-to-point AV distribution over twisted-pair applications
3. Shall have non-continuous foil shielding
4. Cable shall be UL Listed with an LP Rating
5. Plenum-rated.
6. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

B. Category 6A Connector - Typical

1. Unshielded 4-pair connector designed to meet or exceed the TIA-568 standard for Category 6A applications and IEEE 802.3 Type 4 Power-over-Ethernet
2. Should be mod plug type connection
3. Approved Manufacturers:
 - a. Panduit
 - b. Or Approved Equal

C. Audio Cables

1. Mid-Range Speakers
 - a. Shall be plenum rated
 - b. Shall be white
 - c. Shall be unshielded
 - d. 12 AWG/2C
 - e. Approved Manufacturers:
 - 1) West Penn 25227B
 - 2) Or Approved Equal

D. HDMI to HDMI (15 feet or less)

1. Shall be rated for 4K/60
2. Shall support CEC
3. Shall be a minimum of HDMI 2.1a
4. Approved Manufacturers:
 - a. Extron HDMI Ultra Series
 - b. Or Approved Equal

2.8 CABLING ACCESSORIES

A. J-Hooks

1. To be utilized to support AV cabling above accessible ceiling every 5 feet or less.
2. Shall be listed as meeting UL 2239 requirements
3. Shall be listed/approved for installation in return-air plenum spaces
4. Shall be designed and equipped with accessories (if needed) to be supported by the following methods:
 - a. Threaded rod from structure
 - b. Wall-mounted to concrete/CMU walls or wood or metal studs
 - c. Beam clamps
 - d. Optional "multi-tiered" mounting to bottom of J-hook
 - e. Optional Fastener to raised floor pedestal
5. Equipped with retainer or strap over top of J-hook once cables are installed
6. Sized to support quantity of installed cables, plus 25% spare capacity
7. Approved Manufacturers:
 - a. Erico – Caddy CAT Links
 - b. Panduit – J-Mod Cable Supports
 - c. Or Approved Equal

B. Hook & Loop Straps

1. Plenum-rated
2. Velcro construction with hook/loop strap
3. Color: Black
4. Approved Manufacturers:
 - a. Panduit Tak-Ty Plenum Ties
 - b. VELCRO ONE-WRAP
 - c. Or Approved Equal

2.9 LABELING & TESTING

A. Cable Labeling

1. Laser/Ink Jet Self Laminating Labels
2. Approved Manufacturers:
 - a. Panduit – S100X Series
 - b. Or equal from Brady
 - c. Or equal from Dymo
 - d. Or equal from Hellermann Tyton
 - e. Or Approved Equal

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
 - 2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
 - 4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Building Industry Consulting Service International (BICSI)
 - 1. Telecommunications Distribution Methods Manual 13th Edition
 - 2. Outside Plant Design Reference Manual 5th Edition
 - 3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
 - 4. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - 5. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
- E. Electronics Industry Alliance (EIA)
- F. Federal Communications Commission (FCC)
 - 1. FCC Part 15, Radiated Emissions Limits, revised 1998
 - 2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
 - 3. FCC Part 76, Cable Television Service, revised 1998
- G. Insulated Cable Design Consultants Association (ICEA)
 - 1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
 - 2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
 - 3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors
- H. International Electrotechnical Commission (IEC)
- I. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)
 - 1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
 - 2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 - 3. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
 - 4. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms
- J. International Organization for Standardization (ISO)

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1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
 2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
 4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
- K. National Cable Television Association (NCTA)
- L. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
- M. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
 2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
 3. NFPA-101, Life Safety Code
 4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
 5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
- N. National Institute Standards and Technology (NIST)
- O. Occupational Safety and Health Administration (OSHA)
- P. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
 2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
 3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
 4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
 5. ANSI/TIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
 6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
 7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
 8. ANSI/TIA-758-D, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
- Q. Underwriters Laboratories, Inc. (UL)
1. UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
 2. UL 910 (NFPA 262 1990) Applicable Flame Test

3.2 GENERAL REQUIREMENTS

- A. In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify the Design Consultant in writing of any such occurrences before purchasing or installing any equipment or materials. The Design Consultant will notify the Contractor of any actions required to resolve these conflicts. Such actions may include but are not limited to design changes, equipment, materials and/or installation changes. In any event Contractor shall not supersede specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.
- B. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Design Consultant for direction before proceeding with that part of the work.
- C. The Contractor shall be responsible for coordination with other trades to ensure any conflicts or potential conflicts are resolved prior to any work beginning on the project.
- D. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines.
- E. No deviations from the plans or specifications shall be made without full consent in writing of the Design Consultant. The Contractor shall have written approval from the Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.
- F. The Contractor shall obtain written permission from the Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings.
- G. Contractor shall notify the Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.
- H. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
- I. Equipment and materials installed by the Contractor shall be free of defects and damage.
- J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.
- K. Contractor shall test all cables prior to installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

- L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times. Record drawings shall be made available for inspection at the request of the Design Consultant.
- M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
- N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.
- O. Contractor shall make all stored equipment and materials available for inspection at the request of the Design Consultant.
- P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.
- Q. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
- R. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.
- S. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

3.3 GENERAL CABLE INSTALLATION REQUIREMENTS

- A. Test all cables prior to installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.
- B. Cables shall be properly supported in accordance with the Contract Documents, NEC, and industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
- C. Outside of Communications Rooms, cables shall be installed in the following manner:
 - 1. Within cable tray.
 - 2. Supported by J-hooks above accessible ceiling at the following locations/intervals:
 - a. J-hooks shall be independently supported to structure and shall not utilize grid wire.
 - b. J-hooks shall be furnished with closure clips.
 - c. J-hooks shall be provided every 3-feet to 5-feet and at every change in direction or elevation.
 - d. Maximum sag between supports shall be 12-inches.
 - e. No higher than 3-feet above accessible ceiling.
 - f. Neatly bundle and wrap cables with Hook and Loop Straps at ten-foot intervals.
- D. Cables routed in conduit shall have a maximum fill ratio of 40%.
- E. Cables routed in cable tray shall have a maximum fill ratio of 50%.

- F. Cables shall be routed parallel and perpendicular to building structure, except where specifically noted on the Drawings.
- G. Cables shall not be routed in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be temporarily removed and reinstalled after nylon bushings are installed, without additional cost to the Owner.
- H. Cables shall be installed continuous, with no splices – except where specifically indicated on the Drawings.
- I. Cables shall be installed without kinks, paint, or other visible sign of damage. Replace cables damaged during installation or construction without additional costs to the owner.
 - 1. Painted cables are not allowed, even with passing test results. Replace all painted cables without additional costs to the owner.
- J. Use of zip / nylon cable ties to bundle or support cable is prohibited.

3.4 IDENTIFICATION

- A. Permanently affix labels to each cable. Labels shall be affixed at a distance of 3" from the end of each cable end. If label cannot be easily viewed from this placement, cable shall be placed 1" from the cable end. Cable label shall include unique cable number, source system name, source termination point, and destination system name and destination termination point. Cable labels shall be identical on each cable end. Contact Design Consultant for additional information, if necessary.
 - 1. Provide equipment labeling for each device front and back according to the system name used in the shop drawings. Use laminated labels (white print on black labels in front, black print on yellow in back) or equivalent.
 - 2. Provide engraved plastic laminate labels for all racks. Rack labels to be 1" x 2" with white lettering (Arial font) on black matte finish, plastic.

3.5 VIDEO INSTALLATION

- A. Display Device
 - 1. Coordinate all required blocking locations prior to installation.
 - a. All blocking to be FRT rated
 - 2. Coordinate all power requirements prior to installation.

3.6 AUDIO INSTALLATION

- A. Speaker Installation
 - 1. Any device required to be mounted in an exposed ceiling, shall mount from the structure. Coordinate all required cabling and supports for color and aesthetics.
 - a. Any device under 25lbs shall be supported with aircraft wire. Provide weights as necessary to the speaker assembly, to remove device swinging.
 - b. Any device under 25lbs shall be supported with a minimum of a 3/8" threaded rod. Provide balanced supports to remove device swinging
 - 2. Any device being installed directly within the ceiling tile shall be supported from the grid with manufacturers back can and tile-bridge kit.
 - a. All cutting of speaker tile should be coordinated.

- b. Tile replacement speakers can be supported by grid.
3. Any device being installed within a hard-lid ceiling shall be installed with manufacturers required mounting ring.
4. All wall mounted devices to be mounted to minimum sized conduit assembly and junction box. Coordinate all requirements prior to installation.
5. Any speaker cabling should be grounded properly to eliminated ground loop hum.

B. Audio Processing and Amplification Installation

1. Ensure all equipment is grounding/bonded per manufacturer's recommendations.
2. Any output that is natively a balanced output should have a unbalanced line-level audio convertor provided in-line.
3. Coordinate all required audio ducking from fire alarm system

3.7 FUNCTIONAL AND PERFORMANCE TESTING

A. The following additional testing requirements shall be provided:

1. Contractor shall un-pack and pre-test equipment prior to installation into the production environment. All configurations shall be re-verified prior to the units being placed into service.
2. Contractor shall test and commission each component per the specifications and manufacture's installation instructions.
3. Contractor shall test and verify for full operational and network support control functionalities and connections per the specifications and manufacturer's installation instructions.
4. All network devices shall be verified for link and auto negotiation to the highest connection rate.
5. Contractor shall test and verify all functionalities as installed per the specifications and manufacturer's installation instructions.

3.8 TESTING REQUIREMENTS

A. Contractor shall complete a functional test of each component of all provided and installed Audio-Video systems and equipment. These tests shall include, but is not limited to:

1. Audio playback of each loudspeaker and Talk back Function.
2. Audio/Video system control (system on/off, input selection, volume control, etc.)
3. Setup and calibration of each display.
4. HDMI audio-video transmission from each multimedia input plate
5. Audio transmission from each Bluetooth and audio input plate

B. Repair or replace any deficiencies before final site observation by Design Consultant.

3.9 FUNCTIONAL NARRATIVE

A. Typical Consultation Room: Wireless Screen Sharing with shared video conference capabilities for telehealth. All video conference to be achieved through the

1. Audio
 - a. Video Soundbar connected to wireless screen sharing appliance.
2. Video
 - a. Wireless Screen Sharing.

-
3. Control
 - a. Device to be scheduled on/off, via HDMI-CEC and programming.

 - B. Public Viewing Space(s)/Group Room 747': IPTV or Wireless Screen Sharing. Display is to be mounted within the demountable wall partition. All accessory devices to be provided
 1. Audio
 - a. Provide amplifier and route from audio out of display to ceiling mounted speakers
 - b. Audio output from the display to be routed to the amplifier.
 2. Video
 - a. Owner Provided IPTV.
 - b. Wireless Screen Sharing.
 3. Control
 - a. Remote control for IPTV and display.
 - 1) Extend all IR connections to the face of the demountable wall partition.
 - b. Audio to be routed to local volume controller, as shown.

 - C. Staff Lounge: IPTV. Display to be provided for entertainment screen within the lounge.
 1. Audio
 - a. Built-In Display Speakers
 2. Video
 - a. Owner Provided IPTV.
 3. Control
 - a. Remote

 - D. Family Visit Room: IPTV or Wireless Screen Sharing. Display is to be mounted within the demountable wall partition. All accessory devices to be provided.
 1. Audio
 - a. Built-In Display Speakers
 2. Video
 - a. Owner Provided IPTV.
 - b. Wireless Screen Sharing.
 3. Control
 - a. Remote control for IPTV and display.

 - E. Group Room(s): IPTV or Wireless Screen Sharing. Display is to be mounted within the demountable wall partition. All accessory devices to be provided.
 1. Audio
 - a. Built-In Display Speakers
 2. Video
 - a. Owner Provided IPTV.
 - b. Wireless Screen Sharing.
 3. Control
 - a. Remote control for IPTV and display.

 - F. Field Observations

 - G. A minimum of two weeks in advance, notify Design Consultant and Owner as to the readiness for a Field Observation for the following:
 1. Rough-In Observation – after conduits have been installed, but before walls have been installed.
-

2. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.
3. Final Site Observation – a minimum of two weeks before Substantial Completion.

H. During Design Consultant's Final Site Observation of the AV Systems, provide a minimum of one technician fully trained on the operation of all installed AV systems for up to (1) 8-hour day to assist with Design Consultant's functional testing.

I. Non-Conforming Work

1. After receipt of written notice of defective Work, Contractor shall correct all defective Work, or, if the Work has been rejected by the Design Consultant, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages arising out of or relating to such correction or removal.

3.10 DEMONSTRATION, TRAINING, AND ADJUSTMENTS

A. Conduct training sessions to Owner's personnel to demonstrate system operation and preventative maintenance procedures.

1. For AV systems, account for (4) one-hour training sessions

B. Record, label, and catalog all training on USB Flash Drive and "user's manual" written specifically for personnel onsite, for daily routine operations of the systems. Provide the USB Flash Drive and user's manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

3.11 PROJECT CLOSEOUT DOCUMENTATION

A. As-Built Drawings

1. Drawings shall be provided to the Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Design Consultant.
2. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
3. Hardcopy drawings shall be provided in the original size as issued by the Design Consultant.
4. Drawings shall retain the formatting and title block of the original drawings as issued by the Design Consultant.
5. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all equipment room/telecommunication room layouts, wall elevations, equipment rack elevations, ladder racks, cable tray, sleeves, backbone and horizontal cable pathways, workstation locations, and labeling scheme.

B. Test Documentation

1. Test documentation shall be provided to the Design Consultant at the time of substantial completion. Final payment will not be recommended until these test results are received and approved by the Design Consultant.

2. Test results shall be provided in hard copy and electronic format (i.e., manufacturer's proprietary testing software along with applicable reader software) and PDF electronic format.
- C. Manufacturer's Product Warranty
1. Certificate of product warranty shall be provided to the Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Design Consultant.
 - a. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
 - b. One original and two copies of the Manufacturer's product warranty shall be provided.
- D. Contactor's Statement of Warranty
1. Statement of warranty shall be provided to the Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Design Consultant.
 - a. Contractor shall furnish a minimum of a one (1) year warranty on all material and (5) years on labor and workmanship starting at final system acceptance.
 - b. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.
 - c. Contractor shall provide the owner with an Audiovisual Systems Rep, positive point of contact for trouble calls during the (5) year warranty period.
 - d. Contractor shall provide a trouble call response by phone or in person from the Contractors Audio Visual Systems Rep within (4) hours of receiving the owner's request.

Galveston County Mental Health Extended Observation Unit - Equipment List
1/12/2024
Preparer: Atlas Consulting

Room Name:	Room Type:
CONSULT 911	Consultation Room
CONSULT 926	Consultation Room
CONSULT 723	Consultation Room
CONSULT 874	Consultation Room
GROUP 747	Public Viewing Area
GROUP 726	Group Room
GROUP 727	Group Room
SOCIAL 924	Public Viewing Area
SOCIAL & RECLINERS 736	Public Viewing Area
VISITOR 918	Public Viewing Area
FAMILY VISIT 724	Public Viewing Area
STAFF WORKROOM 789	Staff Lounge

SECTION 27 51 23

INTERCOMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section identifies the Requirements, Technical Design, and Specifications for the Intercommunication System at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. Contractor shall include materials, equipment, and labor necessary to provide a complete and functional Intercommunication System regardless of any items not listed or described in this specification or associated drawings.

1.2 RELATED REQUIREMENTS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 0 and 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for all pathway requirements

1.3 CONTRACTOR EXPERIENCE REQUIREMENTS

- A. The Contractor shall possess all relevant Manufacturer Certifications for both the company and individual technicians prior to submitting a bid for the work.
- B. The Contractor's Project Manager shall have a minimum of three (3) years' experience installing and/or project management experience for Intercommunication Systems. This Project Manager shall be available for all onsite coordination meetings.
- C. The Contractor shall have been in business for a minimum of five (5) years.
- D. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
- E. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
- F. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.4 SUBMITTAL REQUIREMENTS

- A. Pre-Installation Submittal

-
1. General Requirements:
 - a. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
 2. Contractor Qualifications
 - a. Manufacturer Product Certifications for Company.
 - b. Manufacturer Product Certifications for Installers.
 - c. Manufacturer Certifications for testing equipment technicians.
 - d. Manufacturer Certifications for testing equipment calibration.
 - e. Resume for Contractor's Project Manager.
 - f. Documentation indicating that Contractor has been in business for (5) years.
 - g. Address of Contractor's local office within a one-hundred-mile radius of the project site.
 - h. Quantity of full-time local technicians within a one-hundred-mile radius of the project site.
 - i. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.
 - j. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.
 - k. List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.
 3. Manufacturer product data sheets for each proposed system component.
 - a. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.
 4. Shop Drawings
 - a. Shop drawings shall be provided clearly depicting any proposed modification to the project drawings. Any modifications shall be highlighted on the shop drawings.
 - b. Shop drawings shall be provided indicating proposed mounting arrangements and details of all equipment, including positioning devices, framework supports and interface with adjacent architecture.
 - c. Shop drawings shall include equipment locations, equipment mounting method, wall elevations, outlet locations, preliminary cable numbers, proposed cable pathways, system schematics, wiring diagrams, and riser diagrams. Shop drawings shall be submitted in 30" X 42" PDFs.
 - d. Shop drawings shall include equipment details. Detail equipment assemblies and indicate dimensions, weights, required clearances, field assembly methods, components, and location of each field connection.

5. Wiring diagrams at a minimum shall include single-line diagram(s) showing interconnection of components along with cabling diagram(s) showing cable routing. Contractor shall maintain a set of shop drawings on site at all times and shall update the shop drawings on a weekly basis. Shop drawings shall be made available for inspection at the request of the Architect/Design Consultant.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The following sections specifically list the acceptable equipment types and items for this project.
- B. Architect/Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.
- C. Proposed equivalent items must be approved in writing by the Architect/Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.
- D. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.
- E. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.
- F. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- G. All wiring, equipment, and installation materials shall be new and of the highest quality.
- H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.
- I. The contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. The contractor shall clearly identify any concerns with lead times in writing to the Architect/Design Consultant prior to submitting a proposal for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as required.

2.2 INTERCOMMUNICATION SYSTEM

- A. System Description
 1. The Intercommunication System shall provide one-way paging to all paging zones, and individually addressed space, indicated on the drawings. Final headend equipment and loudspeaker selection and loudspeaker locations shall be determined by the Contractor and indicated in Pre-Construction Shop Drawing Submittal.
 2. Interfaces, cabling, mounting hardware, loudspeakers, and backboxes as needed for a fully operational Intercommunication System. Interfaces include the following:

- a. Integration with Owner-provided Voice-over-IP Phone System, to all phones to make pages to individual or all zones from their VoIP phone.

B. Approved Manufacturers:

1. Bogen Nyquist
2. Valcom

2.3 HEAD-END

A. Standalone Zone Paging Amplifiers

1. Minimum of 4 channels
2. Minimum of 300W per channel at 70v
3. Provide with rack mount kit.
4. Approved Manufacturers:
 - a. Bogen NQ-A4300-G2
 - b. Or Approved Equal

B. Volume Controllers

1. Color shall matching electrical faceplates
2. Shall be decora
3. Shall allow a minimum of 10W, with integral emergency override
4. Shall allow for increment changes of 3dB
5. Approved Manufacturers:
 - a. Bogen
 - b. Atlas Sound
 - c. Or Approved Equal

2.4 LOUDSPEAKERS

A. 2x2 Ceiling Tile Analog Speaker – S2

1. Shall be full 2x2 ceiling tile replacement
2. Shall have integral 70V transformer
3. Minimum of 8" main cone
4. Shall have integral volume controller
5. Approved Manufacturers:
 - a. Bogen
 - b. JBL
 - c. QSC
 - d. Community
 - e. Or Approved Equal

B. Surface Mounted Analog Speaker – S3

1. Shall have a minimum of 100-degree dispersion
2. Shall have integral 70V transformer
3. Shall have integral selector switch
4. Shall be 15W
5. Include adapter ring for recessed mounting
6. Approved Manufacturers:
 - a. Atlas Sound VTF Series

-
- b. Or Approved Equal

2.5 WALL MOUNTED CLOCKS

A. Digital Clock

1. Shall be 4" Text Height
2. Shall communicate via Category Cabling.
3. Shall be powered by PoE
4. Shall be capable of being wall mounted.
5. Approved Manufacturers:
 - a. Sapling SBP 3000
 - b. Or Approved Equal

2.6 CABLING

A. General

1. The following cable types and cable specifications are conditionally approved for use as needed for the Intercommunication System. Final cable type and locations shall be determined by the Contractor as part of a complete, turn-key Intercommunication system

B. Zone Paging Cabling

1. Should be plenum rated
2. Should be a minimum of 22AWG
3. Should be 2-conductor shielded
4. Color: White
5. Manufacturer:
6. Approved Manufacturers:
 - a. West Penn
 - b. Belden
 - c. Or Approved Equal

C. Cross Connect Blocks

1. Shall be a 50-Pair block
2. 66-Style Output
3. Shall include standoff bracket
4. Shall have integral RJ-21 output
5. Approved Manufacturers:
 - a. Siemon
 - b. Leviton
 - c. Or Approved Equal

2.7 PATHWAY CABLE SUPPORT

A. J-Hooks

1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Erico – Caddy Adjustable Cable Support Series

-
- B. Velcro Wrap – Plenum-Rated
 - 1. Panduit Plenum Rated Hook & Loop (Black)
 - 2. Erico – Caddy Grid Support – Part Number – ATA41 or ATS41

2.8 LABELING

- A. Permanent Labels
 - 1. Laser/Ink Jet Self Laminating Labels
 - a. Panduit Part Number Series – S100X*****

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
 - 2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
 - 4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Building Industry Consulting Service International (BICSI)
 - 1. Telecommunications Distribution Methods Manual 13th Edition
 - 2. Outside Plant Design Reference Manual 5th Edition
 - 3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
 - 4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
 - 5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- E. Electronics Industry Alliance (EIA)
- F. Federal Communications Commission (FCC)
 - 1. FCC Part 15, Radiated Emissions Limits, revised 1998
 - 2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
 - 3. FCC Part 76, Cable Television Service, revised 1998
- G. Insulated Cable Design Consultants Association (ICEA)
 - 1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
 - 2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors

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3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors
- H. International Electrotechnical Commission (IEC)
- I. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)
1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
 2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
 3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
 5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms
- J. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
 2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
 4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
- K. National Cable Television Association (NCTA)
- L. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
- M. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
 2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
 3. NFPA-101, Life Safety Code
 4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
 5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
- N. National Institute Standards and Technology (NIST)
- O. Occupational Safety and Health Administration (OSHA)
- P. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
 2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
 3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
 4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
 5. ANSI/TIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
 6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.

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7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
 8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
- Q. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
 2. RUS Bull 1751F-643 (2002) Underground Plant Design
 3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
 4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
 5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
 6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
 7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
 8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
- R. Underwriters Laboratories, Inc. (UL)
1. UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
 2. UL 910 (NFPA 262 1990) Applicable Flame Test

3.2 GENERAL REQUIREMENTS

- A. In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify the Architect/Design Consultant in writing of any such occurrences before purchasing or installing any equipment or materials. The Architect/Design Consultant will notify the Contractor of any actions required to resolve these conflicts. Such actions may include but are not limited to design changes, equipment, materials and/or installation changes. In any event Contractor shall not supersede specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.
- B. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect/Design Consultant for direction before proceeding with that part of the work.
- C. The Contractor shall be responsible for coordination with other trades to ensure any conflicts or potential conflicts are resolved prior to any work beginning on the project.
- D. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines.

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- E. No deviations from the plans or specifications shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Architect/Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.
 - F. The Contractor shall obtain written permission from the Architect/Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings.
 - G. Contractor shall notify the Architect/Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect/Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.
 - H. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
 - I. Equipment and materials installed by the Contractor shall be free of defects and damage.
 - J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.
 - K. Contractor shall test all cables prior to installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.
 - L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect/Design Consultant.
 - M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
 - N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.
 - O. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect/Design Consultant.
 - P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.
 - Q. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
 - R. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

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- S. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.
 - T. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

3.3 SYSTEM REQUIREMENTS

- A. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a complete and functioning system. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity shall be furnished.
 - 1. Audio playback in each zone shall be a minimum of 10dB above ambient background noise.
- B. Intercommunication System
 - 1. Description of Work
 - a. The intercommunication system shall be compatible with and provide for integration with the Owner's Voice-over-IP Phone System.
 - b. The deployed system is to be an IP-based head-end with analog endpoints.
 - 1) Each zone shall receive separate zone paging module.
 - c. Contractor shall coordinate layout and installation of ceiling-mounted speaker and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
 - d. The Contractor shall furnish and install all equipment including, but not limited to, outlet boxes, wiring, speakers, and all other necessary equipment to provide a complete operating system as indicated with the contract documents. Provide all necessary wall plates, specialty boxes, etc., not provided by others.
 - e. Contractor is responsible to provide shop drawings of the as-installed system.
 - f. Loudspeakers to be connected in parallel as appropriate. To facilitate future troubleshooting, no parallel speaker chain shall include more than ten (10) loudspeakers. Areas with more than ten (10) loudspeakers shall include home runs of sufficient quantity to ensure that no single run has more than six loudspeakers.
 - g. All zoned cabling shall route back to a wall-mounted 66-block in the nearest telecommunications room. 66-block shall be hosted to fire resistant plywood.
 - h. Furnish and install all system equipment, devices, accessories, and material in accordance with these specifications and drawing to provide a complete and operating system.
 - 2. Additional Description of Work
 - a. Contract documents are detailed only to the extent required to show design intent. It shall be understood and agreed upon by the Contractor that all work described herein shall be complete in every detail. Contractor Shall:
 - 1) Furnish additional items not mentioned herein to meet requirements as specified without claim for additional payments. Items may include hardware, rack panels, and other devices that are required for installation.
 - b. Ensure that all labor furnished be manufacture trained and experienced in Intercommunication Systems.
 - c. Ensure that all equipment unless otherwise specified, shall be new, free from defects, and of the best craftsmanship in its class.

- d. Perform initial programming of system and audio level adjustments.
- e. Perform final programming of system and audio level adjustments.
- f. Provide system documentation including equipment manuals and drawings.
- g. Guarantee all equipment and components for their specified period from date of acceptance.
- h. Provide information on system requirements to any Contractor responsible for supplying related materials for this system.
- i. The Contractor shall verify all ceilings with specified speaker types prior to installation. Contractor is responsible to provide speaker types as required to mount in the specified locations. If the speaker types are found to be incompatible with the ceiling types, the contractor shall notify the Architect/Design Consultant. If the contractor does not notify the Architect/Design Consultant of any discrepancies, the installation will be assumed to be accounted for in the highest quality and most costly and/or difficult manner.
- j. The Contractor shall be responsible for and repair all damage to buildings due to carelessness of workmen, including ceiling tiles, and exercise all reasonable care to avoid any damage to the Owner's property. The Contractor shall make note of all existing damage, and provide photographs of the damage, prior to beginning any work.

C. Speaker Installation:

1. Any device being installed directly within the ceiling tile shall be supported from the grid with manufacturers back can and tile-bridge kit.
 - a. All cutting of speaker tile should be coordinated.
 - b. Tile replacement speakers can be supported by grid.
2. Any device being installed within a hard-lid ceiling shall be installed with manufacturers required mounting ring.
3. All wall mounted devices to be mounted to minimum sized conduit assembly and junction box. Coordinate all requirements prior to installation.
 - a. Provide all necessary weatherproofing, sealing, and gaskets for any speaker in a wet-rated or outdoor environment.
4. Any speaker cabling should be grounded properly to eliminated ground loop hum.
5. Coordinate color of speakers with ceiling finishes, prior to purchase and installation.

D. Head-End

1. Programming:
 - a. Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and results.
 - b. Once initial system programming is implemented, allow owner a 2-month period to utilize system and make comments.
 - 1) Provide a minimum of (4) additional hours of programming, based on feedback
 - c. After initial evaluation period coordinate with Owner. Record Owner's feedback and provide adjustments as requested.

E. System Zoning and Partitioning

1. At a minimum the following zones shall be broken out:
 - a. Employee only areas consisting of 789, 757, 759, 914, 915, 730, 735.
 - b. EOU consisting of areas 747, 736, 924, 756, 926, 737.
 - c. General Areas consisting of 855, 911, 723, 726, 727.

2. For each zone provided from a given telecommunications room, provide a zone attenuator, wall mounted next to the provided 66-blocks.

F. Cable Support

1. All cables shall be installed and supported in the main building basket tray.
2. When cables leave the main pathway systems as indicated on the technology drawings, they shall be installed and supported in Contractor furnished and installed j-hooks or adjustable cable supports.
3. No cable pathway shall exceed 40% fill ratio.
4. J-hooks and adjustable cable supports shall be installed no more than five-feet (5') apart on center, using only manufacturer-approved installation methods and hardware.
5. J-hooks and adjustable cable supports shall be installed no higher than 3-feet above the accessible ceiling to allow for ease of access for future moves, adds and changes
6. If utilizing ceiling grid wire, that is contractor installed, both ends shall be supported and independent from the grid wire to provide support for the actual grid and ceiling tile. Grid wire shall be painted blue and attached to ceiling grid with a Caddy Component Support.
7. J-hooks shall be furnished with closure clips.
8. Maximum sag between supports shall not exceed twelve inches (12").
9. Contractor shall establish j-hook and adjustable cable supports pathways and shall coordinate pathways with all other disciplines. Under no-circumstances shall these pathways be used to support other low-voltage applications not included in this specification.
10. Cable Dressing
 - a. No nylon cable ties shall be used at any time during the installation of the cable.
 - b. Above Ceiling
 - 1) Contractor shall furnish and install plenum-rated hook & loop straps in plenum-rated airspaces.
 - 2) The Contractor shall install no more than (1) hook & loop strap between each j-hook or saddle strap or at service loop locations.
 - c. Equipment Rooms / Telecommunications Rooms
 - 1) The Contractor shall bundle all visible cables with Contractor furnished and installed hook & loop straps.
 - 2) Hook & loop straps shall be installed twenty-four (24) inches apart on center.

G. Equipment Rooms / Telecommunications Room Build-Out

1. Where equipment supports rack-mounting, provide and install Intercommunication System equipment in telecommunication racks.

H. System Labeling

1. Contractor shall verify room numbers and confirm the final room numbering scheme prior to generating any labels.
2. Cables shall be labeled within (12) inches from the termination point inside the Equipment Room/Telecommunications Rooms.
3. Cables shall be labeled within (6) inches from the termination point at the device end.
4. Cables shall be labeled identically at both ends.
5. All speakers shall be labeled with the same designation as the PA cables.
6. The Intercommunication System designation shall consist of three fields with a dash between each field.

7. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
8. The second field shall be a 1 – 3 digit cable number that is unique for a particular wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be the third cable shall be 3, etc.
9. The third field shall be a 1 – 5 character alphabetic field to identify the system the cable supports. For the PA system, it will be PA.
10. The fourth field will be a numeric character to identify a particular daisy-chained cable within that daisy-chained group.
11. Indicated proposed labeling scheme on pre-construction shop drawings.

3.4 TESTING REQUIREMENTS

- A. Contractor shall un-pack and pre-test equipment prior to installation into the production environment. All configurations shall be re-verified prior to the units being placed into service.
- B. Contractor shall test and commission each component per the specifications and manufacture's installation instructions.
- C. Contractor shall test and verify for full operational and network support control functionalities and connections per the specifications and manufacturer's installation instructions.
- D. All network devices shall be verified for link and auto negotiation to the highest connection rate.
- E. Contractor shall test and verify all audio-visual functionalities of each device and loudspeaker as installed per the specifications and manufacturer's installation instructions.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 1. Schedule tests with at least seven days' advance notice of test performance.
 2. After installing paging system components and after electrical circuitry has been energized, test for compliance with requirements.
 3. Operational Test:
 - a. Test originating all-call and page messages from Owner's VoIP phone. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.
 - b. Test bell/tone integration from Video Intercom call station.
 4. Inspection: Verify that headend equipment, cables and loudspeakers are properly labeled, and interconnecting wires and terminals are identified.
 5. Verify the server and devices are running the latest software revisions.
- B. Adjusting
 1. On-Site Assistance: Provide a minimum of two technicians on-site for one 8-hour day at within the first year after substantial completion to adjust system sound levels and for any initial troubleshooting as requested by Owner.
- C. Demonstration / Train

1. Train Owner's maintenance personnel to adjust, operate, and maintain the Intercommunication System. Account for (2) four-hour training sessions.
2. Record, label, and catalog all training on USB Flash Drive and "user's manual" written specifically for personnel onsite, for daily routine operations of the systems. Provide the USB Flash Drive and user's manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

3.6 PROJECT CLOSEOUT DOCUMENTATION

A. Post-Installation Submittal

1. As-Built Drawings
 - a. Drawings shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect/Design Consultant.
 - b. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
 - c. A 30" x 42" laminated diagram of the speakers being served by a given telecommunications room shall be provided for each and every telecommunications room hosting Overhead Paging Equipment.
 - d. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all equipment.
 - e. As-built drawings shall include but not be limited to:
 - 1) Equipment layouts
 - 2) Wall elevations
 - 3) System schematics
 - 4) Wiring diagrams
2. Additional Documentation
 - a. Equipment Operation & Maintenance manuals
 - b. Installed equipment list (manufacturer model numbers, serial numbers, installed locations, etc.)
 - c. Configuration information (MAC addresses, IP addresses, etc.)
 - d. Warranty support information
 - e. Documentation shall be bound, sectioned, and tabbed in the following order (when applicable):
 - 1) Equipment O&M Manuals
 - 2) Installed Equipment List
 - 3) Configuration Information

B. Test Documentation

1. Test documentation shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until these test results are received and approved by the Architect/Design Consultant.
2. Test results shall be provided in PDF electronic format.

C. Manufacturer's Product Warranty

1. Certificate of product warranty shall be provided to the Architect/Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.

- a. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
- b. The Contractor shall furnish the original Letter of Warranty to include the name, address and phone number contacts for warranty call outs to the Architect/Design Consultant at the time of substantial completion.

D. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect/Design Consultant.
 - a. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
 - b. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 27 51 23

SECTION 28 00 10

GENERAL REQUIREMENTS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section and the associated drawings identify the requirements, technical design, and specifications for Security Systems at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. Functionally complete Security Systems shall be provided in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result shall be provided whether specifically called for or not, at no additional cost to Owner.
- C. The Security Systems include the following:
 - 1. 28 05 33 – Pathways for Security Systems
 - 2. 28 10 00 – Access Control System
 - 3. 28 20 00 – Video Surveillance System

1.2 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 0 and 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.
- B. Refer to Division 26 for Electrical System requirements.
- C. Refer to Division 27 for Communication requirements.

1.3 CONFIDENTIALITY

- A. Limit access to physical and electronic versions of these Division 28 specifications and associated Drawings to individuals directly involved in performing the Work.
- B. Pursuant to Texas Statute 418.182, certain portions of Division 28 specifications and associated drawings relate "to the specifications, operating procedures, or location of security system used to protect public or private property from an act of terrorism or related criminal activity" and as such are confidential.

1.4 ABBREVIATIONS

- A. ADA – Americans with Disabilities Act

- B. AFF – Above Finished Floor
- C. AHJ – Authority Having Jurisdiction
- D. ANSI – American National Standards Institute
- E. AV – Audiovisual
- F. BOM – Bill of Materials
- G. CAT – Category
- H. CD – Construction Document
- I. DAS – Distributed Antenna System
- J. EMI – Electromagnetic Interference
- K. EMT – Electrical Metallic Tubing
- L. ERRCS – Emergency Responder Radio Coverage Systems
- M. FACP – Fire Alarm Control Panel
- N. FCC – Federal Communications Commission
- O. F/UTP – Foiled, Unshielded Twisted Pair
- P. GC – General Contractor
- Q. GMP – Guaranteed Maximum Price
- R. GUI – Graphical User Interface
- S. HVAC – Heating, Ventilation, and Air-Conditioning
- T. IBC – International Building Code
- U. ICT – Information and Communications Technology
- V. IDF – Intermediate Distribution Frame; a secondary Telecommunications Room/Enclosure in a building
- W. IMC – Intermediate Metal Conduit
- X. ISO – International Organization for Standardization
- Y. ISP – Inside Plant
- Z. ISP – Internet Service Provider
- AA. IT – Information Technology

- BB. LAN – Local Area Network
- CC. MDF – Main Distribution Frame; the main Telecommunications Room/Enclosure
- DD. MPOE – Main Point of Entry
- EE. MTBF – Mean Time Between Failures
- FF. NEC – National Electric Code
- GG. NEMA – National Electrical Manufacturers Association
- HH. NFPA – National Fire Protection Association
- II. NRTL – Nationally Recognized Testing Laboratory
- JJ. OEM – Original Equipment Manufacturer
- KK. OSP – Outside Plant
- LL. PoE – Power over Ethernet
- MM. POS – Point of Sale
- NN. POTS – Plain Old Telephone Service
- OO. RF – Radio Frequency
- PP. RFI – Request for Interpretation/Information
- QQ. RMC – Rigid Metal Conduit
- RR. RU – Rack Unit
- SS. ScTP – Screened Twisted Pair
- TT. STP – Shielded Twisted Pair
- UU. TIA – Telecommunications Industry Association
- VV. TR – Telecommunications Room
- WW. U/FTP – Unshielded Twisted-Pair Cable with Foil Screened Twisted-Pair Conductors
- XX. UL – Underwriters Laboratory
- YY. UPS – Uninterruptible Power Supply
- ZZ. USB – Universal Serial Bus
- AAA. UTP – Unshielded Twisted Pair
- BBB. VLAN – Virtual LAN

1.5 DEFINITIONS

- A. Wherever used in the Division 28 specifications, or associated drawings, and printed with initial capital letters; the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. If any of these terms are defined in the General Conditions in Division 1, those definitions shall take precedence.
1. Addenda – written or graphic instruments issued prior to the completion of initial bids, which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. Bidding Documents – the Bidding Requirements and the proposed Contract Documents (including all Addenda).
 3. Bidding Requirements – The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 4. Change Order – A document recommended by Design Consultant which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 5. Telecommunication(s) Room – A generic term for a dedicated room for information technology equipment, frequently referred to as Telecommunications Room, Telecom Room, IDF, MDF, IT Room, or Equipment Room.
 6. Contract – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 7. Contract Documents – Those items so designated in the agreement between Owner and Contractor covering the Work. The Contract Documents are complementary; what is required by one is as binding as if required by all.
 8. Contractor – The individual or entity with whom Owner has entered into the Agreement.
 9. Design Consultant – the design firm responsible for creation of these Division 28 specifications and associated Drawings – Atlas Consulting.
 10. Drawings – The part of the Contract Documents prepared or approved by Design Consultant which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
 11. General Requirements – Sections of Division 1 of the Specifications.
 12. Laws and Regulations – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
 13. Owner – the individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
 14. Project – the total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
 15. Samples – physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which established the standards by which such portion of the Work will be judged.
 16. Shop Drawings – all drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
 17. Site – lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of the Contractor.

18. Specifications – the part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
19. Subcontractor – an individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
20. Substantial Completion – the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Consultant, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
21. Supplementary Conditions – the part of the Contract Documents which amends or supplements these General Conditions; Division 0 & Division 1 of these Contract Documents.
22. Supplier – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
23. Work – the entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

B. Terminology

1. The words and terms below are not defined, but when used in Division 28 specifications and related Drawings, have the indicated meaning:
 - a. Intent of Certain Terms and Adjectives:
 - 1) The Contract Documents include the terms “as allowed,” “as approved,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Design Consultant. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Design Consultant as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Design Consultant any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the following provisions or any other provision of the Contract Documents.
 - 2) Limitations on Design Consultant’s Authority and Responsibilities
 - a) Design Consultant will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Design Consultant will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.

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- b) Design Consultant will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 - b. Day – the word “Day” means a calendar day of 24 hours measured from midnight to the next midnight. Typical “Day” is indicative of business hours, Monday-Friday.
 - c. Defective – the word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1) Does not conform to the Contract Documents; or
 - 2) Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3) Has been damaged prior to Substantial Completion.
 - d. Furnish – the word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - e. Install – the word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - f. Provide – the word “provide” and “perform,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 - g. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied, and those services, materials and equipment shall be furnished and installed.
- C. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contractor Documents in accordance with such recognized meaning.

1.6 REFERENCE STANDARDS

- A. Standards, Specifications, Codes, Laws, and Regulations
 - 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
 - 2. For referenced standards and guidelines that have not been adopted into code or law, the most recent version / edition of the standard and guideline shall be followed, except for the following:
 - 3. Where the Contract Documents clearly establish size, quantity, and/or quality of services, materials, or equipment and/or the means, methods, techniques, sequences, or procedures of construction; in these instances, Contract Documents requirements shall take precedence.
 - 4. Whenever the Contract Documents details a requirement that violates an adopted code, law, or regulation, submit RFI to Consultant prior to Bid or performing the Work.
- B. Codes and Regulations

1. The following codes, laws and regulations are known to have requirements that affect Communications Systems and are listed here for reference. Refer to Part 1 Coordination paragraph in this section for requirements when there are any discrepancies between these codes, laws and regulations and the Contract Documents. All codes shall meet the required 2021 City of Austin Adopted Codes.
 - a. 2010 ADA Standards for Accessible Design
 - b. ASCE 07 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures
 - c. FCC Rules and Regulations
 - d. National Electric Safety Code
 - e. NFPA 70 – National Electric Code
 - f. NFPA 72 – National Fire Alarm and Signaling Code
 - g. NFPA 101 – Life Safety Code
 - h. NFPA 1225 – Standard for Emergency Services Communications
 - i. 2012 Texas Accessibility Standards

- C. Standards
 1. Refer to individual sections for additional requirements.

- D. Guidelines
 1. Refer to individual sections for additional requirements.

- 1.7 QUALITY ASSURANCE
 - A. Contractor Qualifications
 1. Refer to individual sections for requirements.

 - B. Personnel Qualifications
 1. At all times during the progress of the Work, Contractor or Subcontractor shall assign a competent Project Manager who shall not be replaced without written notice to Owner and Design Consultant except under extraordinary circumstances.
 2. Refer to individual sections for additional requirements.

 - C. Network and Cybersecurity Requirements
 1. Network integrity is critical to Owner's operation of the Facility. Refer to Software, Network, and Cybersecurity Requirements paragraph in Part 3 of this Section.

- 1.8 WARRANTY
 - A. Contractor's General Warranty and Guarantee
 1. If the General Requirements do not establish Contractor's General Warranty and Guarantee, then the following requirements are in effect for Communications Systems Work:
 - a. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Design Consultant and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

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- b. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1) Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2) Normal wear and tear under normal usage.
 - c. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1) Observations by Consultant.
 - 2) Recommendation by the Consultant or payment by Owner of any progress or final payment.
 - 3) The issuance of a certificate of Substantial Completion by Consultant or any payment related thereto by Owner.
 - 4) Use or occupancy of the Work or any part thereof by Owner.
 - 5) Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Consultant.
 - 6) Any inspection, test, or approval by others; or
 - 7) Any correction of defective Work by Owner.

B. Manufacturer Warranty

- 1. Refer to individual sections for additional requirements.

C. Special Warranty

- 1. Refer to individual sections for additional requirements.

1.9 SUBMITTALS

A. General Submittal Requirements:

- 1. Refer to General Requirements or Division 1 for general submittal requirements. Refer to individual sections in Division 28 for additional requirements.
- 2. Submittals and Shop Drawings shall not utilize the Design Consultant's logo, stamp, or the title block from the Construction Drawings; if either of these are submitted, the Submittal(s) will be rejected without review.
- 3. Inadequate or Incomplete Submittals and/or Shop Drawings will not be reviewed and will be returned to the Contractor.

B. Pre-Bid

- 1. Pre-Bid submittals can generally include:
 - a. Clarifying questions.
 - b. Product Substitution requests.
 - c. Contractor and personnel qualification documentation.
- 2. Refer to individual sections for specific Pre-Bid requirements.

C. Bid

- 1. Refer to individual sections for additional Division 28 requirements due with Bid, which may include – but is not limited to – the following:

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- a. Contractor and personnel qualification documentation
 - b. Unit Pricing
- D. Pre-Construction
- 1. Procedures:
 - a. Before submitting Pre-Construction submittals, Contractor shall have:
 - 1) Reviewed and coordinated each Shop Drawing with other Shop Drawings and with the requirements of the Work and the Contract Documents.
 - 2) Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
 - 3) Determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 4) Determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 - b. With each submittal, Contractor shall give Design Consultant specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separates from the Shop Drawings or submittal; and, in addition, by a specific notation made on each Shop Drawing submitted to Design Consultant for review and approval of each such variation.
 - c. Design Consultant's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents.
 - d. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Consultant.
 - e. Contractor shall ensure submittals are submitted in a timely manner to ensure all products can be ordered and received on site in order to not cause any delays. If there are any concerns with any products having long lead times, those products shall be clearly identified in writing so the review and approval can be expedited.
 - f. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will be returned unreviewed.
 - g. Each submittal shall be sub-divided by the corresponding specification section. Provide a line-by-line compliance statement for each section, identify the following per article and sub-section:
 - 1) Compliant – Following the specification.
 - 2) Non-Compliant – Not following the specification with an explanation. If there is a deviation from the specs, prior approval shall have been submitted and approved.
 - 2. Bill-of-Materials / Product Index
 - a. Provide a typed listed with each product/equipment being provided as part each Section. List shall include the following, in the exact same order as listed in Division 28 specifications:
 - 1) Product/Equipment specification name
 - 2) Manufacturer
 - 3) Model name
 - 4) Model number

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3. Product Data
 - a. Provide product data sheet for each material, equipment, device, etc. listed in Part 2 of these specifications. Data sheet shall include manufacturer name, product name, part number and relevant product specifications in an 8.5"x11" PDF format.
 - b. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified may not be approved.
 4. Shop Drawings
 - a. Shop Drawings shall include the following:
 - 1) Contractor or Subcontractor's Title Block; drawing size shall match Construction Drawings (i.e., 30" x 42"). Title Block shall include:
 - a) Project name and address
 - b) Contractor/Subcontractor company name and contact information.
 - c) Name and contact information of Contractor/Subcontractor's Project Manager.
 - 2) Legend page with all symbols defined.
 - 3) Floors plans (minimum scale of 1/8" = 1'-0") for all areas with Division 28 Work. Floor plans shall include north arrow, key plan, and indicate device/equipment locations, and associated pathway routing and size.
 - 4) Enlarged plans (minimum scale of 1/4" = 1'-0") and rack and wall elevations for Telecommunications Room/Enclosure, Equipment Rooms, etc., indicating exact location where equipment is intended to be installed. Enlarged plans shall include north arrow.
 - 5) Riser diagrams, details, coordination views, etc. to indicate Contractor has a full understanding of required Work and is coordinated with other trades.
 - b. Where installation location is critical – such as in Telecommunications Room/Enclosure and Equipment Rooms, as well as outlet/device location height above finished floor – indicate figured dimension on Shop Drawings.
 - c. Refer to individual sections for additional Shop Drawing requirements.
 5. Samples
 - a. Refer to individual sections for requirements.
 6. Certificates
 - a. Refer to individual sections for requirements.
- E. Refer to individual sections for additional Pre-Construction Submittal requirements.
- 1.10 PROJECT CLOSEOUT
- A. Bill-of-Materials / Product Index – Update Bill-of-Materials that was included in the Pre-Construction Submittal with actual equipment installed. Include columns populated with the following information:
 1. Product Name (from Specifications)
 2. Manufacturer
 3. Model Number
 4. Quantity
 5. Manufacturer Warranty Period
 - B. Product Data (Cutsheets)
 1. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

C. Operation and Maintenance Data

1. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

D. Warranty Documentation

1. Include PDF copy of any Warranty documentation and/or certifications that came with the installed products or required by these Specifications.
2. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

E. Test Results

1. Include PDF copy of Functional Test Reports for each section.
2. Refer to individual sections for testing requirements.

F. Spare Parts and Tools

1. At time of Owner Training, furnish any and all spare parts and tools to the Owner that are required by the Contract Documents.
2. In the Project Closeout Submittal, include PDF copy of delivery receipt, indicating items and quantities that were furnished to the Owner, as well as the date, time, and Owner Representative that took possession of the items.
3. Refer to individual sections for additional requirements.

G. Record Drawings ("As Built")

1. Maintain a copy of approved Submittals, Shop Drawings, and Change Orders on the Site (or the Project's Construction Administration website), and update with changes during construction. Any minor changes to the Drawings shall be updated on a weekly basis. These drawings shall be made available for inspection at any point during construction when requested by the Consultant.
2. At the conclusion of the project, utilize AutoCAD or BIM software (such as Revit or Navisworks) to incorporate the changes to the Shop Drawings.
3. PDF markups will not be acceptable.
4. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
5. Refer to individual sections for additional requirements.

H. Special Requirements – Refer to individual sections for additional requirements.

1.11 COORDINATION

- A. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to the Consultant any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has knowledge of, and shall obtain a written interpretation or clarification from the Consultant before proceeding with any Work affected thereby.

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- B. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to the Consultant in writing. Contractor shall not proceed with the Work affected thereby until an amendment or supplement to the Contract Documents has been issued.
- C. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- D. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- E. Refer to General Requirements / Division 1 for Schedule requirements. Subcontractors for Division 28 Work shall coordinate with Contractor in establishing schedules and timetables to perform the Work and perform that Work per those established schedules.
- F. The Contractor/Subcontractor for each Division 28 Section shall maintain a Project Manager (per the Quality Assurance paragraph of that Section) that is on the jobsite whenever Work for that Section is being performed. This Project Manager shall coordinate the Work with other trades, such that Division 28 Work is installed per the Schedule, with the required clearances for all Divisions of Work, and meets the required codes and standards.
- G. Division 28 Work shall not impair, hinder, or delay work of other trades.
- H. Before starting Work, examine adjacent Work performed by other divisions (trades) to determine if there are any conditions that would be detrimental or prevent Division 28 Work from being a successful installation. Notify issues to Contractor for remediation prior to starting Work.
- I. Unless otherwise indicated with a figured dimension, Drawings are schematic - indicating approximate location of devices and equipment. Security devices and equipment may be figure-dimensioned on the Architectural Drawings, which take precedence over the approximate locations on the technology Drawings. Where neither Architectural or Technology Drawings include a figured dimension, exact location shall be determined by scaled dimension and coordination with requirements of other trades. Errors that could have been avoided by proper coordination shall be corrected without additional costs to the Owner.
- J. Coordination with other Division(s):
1. Division 21 Fire Suppression
 - a. Ensure no piping is routed overhead through a Telecommunications Room or Equipment Room, except where serving a Fire Suppression Device in the Communications/Equipment Room.
 2. Division 22 Plumbing
 - a. Ensure no piping is routed overhead through a Telecommunications Room/Enclosure or Equipment Room.
 3. Division 23 Mechanical
 - a. Ensure no piping or ductwork is routed overhead through a Telecommunications Room/Enclosure or Equipment Room, except where serving Mechanical equipment in the Communications/Equipment Room.
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4. Division 26 Electrical
 - a. Ensure no conduits are routed overhead through a Telecommunications Room/Enclosure or Equipment Room, except where serving an Electrical panelboard or receptacles in the Communications/Equipment Room.
 - b. Coordinate exact location of receptacles/ hard-wired circuits for Division 28 equipment with Division 26 Contractor prior to rough-in installation.
 - c. Prior to connecting Division 28 devices and equipment to an electrical receptacle, utilize a ground circuit impedance tester to detect any wiring errors and low equipment ground impedances. If any issues are detected, notify Division 26 Contractor for correction prior to connecting Division 28 devices and equipment.
 5. Division 27 Communication Systems
- K. Preinstallation Meetings
1. Refer to individual sections for additional requirements.
- L. Sequencing / Scheduling
1. Refer to individual sections for specific sequencing / scheduling requirements.
- 1.12 PATENT FEES, ROYALTIES, PERMITS, AND TAXES
- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others.
 - B. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.
 - C. Unless otherwise provided in the Supplementary Conditions, Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
- 1.13 DELEGATION OF PROFESSIONAL DESIGN SERVICES
- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

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- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Design Consultant will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed 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 Design Consultant.
 - C. Owner and Design Consultant shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Design Consultant have specified to Contractor all performance and design criteria that such services must satisfy.
 - D. Pursuant to this Paragraph, Design Consultant's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Materials and equipment incorporated into the Work shall be as specified and of good quality and new, except as otherwise noted in the Contractor Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by these specifications or when requested by the Owner or Design Consultant, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- B. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
- C. Performance Criteria
 - 1. Regulatory Requirements
 - a. Utilize products listed by a National Recognized Testing Laboratory (such as UL), except where no relevant standard exists. These products shall bear a permanent mark/label of the NRTL.
 - b. All equipment and material used in the installation shall be listed for the environment in which it is being installed. Examples – plenum-rated were installed in a return air plenum; wet or outdoor listed where installed in Wet or Damp Locations.
 - c. Refer to individual sections and products for specific NRTL requirements.
 - 2. Sustainability Characteristics
 - a. Refer to General Requirements / Division 1 for general Project and Product Sustainability requirements.
 - b. Refer to individual Division 28 sections and products for specific Sustainability requirements.

D. Lead Time Issues

1. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Consultant prior to submitting a Bid for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the Work as required.

E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.

F. In the event of a discrepancy between these Specifications and the Drawings, the greater quantity and/or better quality shall be assumed for Bidding purposes.

2.2 SUBSTITUTES AND "OR EQUALS"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to the Consultant for review under the circumstances described below.

1. "Or-Equal" Items: If, in the Design Consultant's approval, an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Design Consultant as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. In the exercise of reasonable judgment, the Design Consultant determines that:
 - 1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics.
 - 2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole.
 - 3) It has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work
 - 1) There will be no increase in cost to the Owner or increase in Contract Times: and
 - 2) It will confirm substantially to the detailed requirements of the item named in the Contract Documents.
 - 3)
2. Substitute Items:
 - a. If, in the Design Consultant's approval, an item of material or equipment proposed by Contractor does not qualify as an "Or Approved Equal" item under the Paragraph above, it will be considered a proposed substitute item.

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- b. Contractor shall submit sufficient information as provided below to allow Design Consultant to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by the Design Consultant from anyone other than Contractor.
- c. Contractor shall make written application to the Consultant for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. Requests for substitution must be submitted ten calendar days prior to the bid date, any request received after that time period will be excluded from consideration. The application:
- 1) Shall certify that the proposed substitute item will:
 - a) Perform adequately the functions and achieve the results called for by the general design
 - b) Be similar in substance to that specified
 - c) Be suited to the same use as that specified
 - 2) Will state:
 - a) The extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time
 - b) Whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item
 - c) Whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty
 - 3) Will identify:
 - a) All variations of the proposed substitute item from that specified, and
 - b) Available engineering, sales, maintenance, repair, and replacement services; and
 - 4) Shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- d. Cost Reimbursement: in certain situations, evaluating a proposed substitution will require additional time by the Design Consultant. These situations will either be described in subsequent Specification sections or conveyed in writing to the Contractor prior to evaluation by the Design Consultant. Design Consultant will record Design Consultant's costs in evaluating the proposed substitution. Whether or not Design Consultant approves the proposed substitution, Contractor shall reimburse Owner for the reasonable charges of Design Consultant for evaluating each proposed substitute. Contractor shall also reimburse Owner for the reasonable costs for Consultant, Architect, and Engineer(s) in making changes in the Contract Documents resulting from the acceptance of each proposed substitute.
- B. Proposed equivalent items shall be approved by Consultant prior to purchase or installation. Proposed equivalent items shall meet or exceed these specifications and the specifications of the specified item.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Verification of Conditions

1. Underground Facilities

- a. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Communications Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Design Consultant by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1) Owner and Design Consultant shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 - 2) The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a) Reviewing and checking all such information and data.

B. Pre-installation Testing

1. Refer to individual sections for requirements.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

D. No deviations from the Contract Documents shall be made without full consent in writing of the Consultant. The Contractor shall have written approval from the Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

E. Cleaning

1. During the progress of the Work, Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations. Contractor shall dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
2. Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

F. Protection

1. The Contractor shall protect Communications Work from damage by other trades and theft.
 - a. Any Division 28 cabling that has more than 2-inches of paint on the jacket shall be replaced without additional cost to the Owner.

2. Where owner-furnished or provided equipment is installed prior to Substantial Completion, access to that room or area shall be restricted/locked whenever unoccupied.

3.2 REPAIR / RESTORATION

- A. Contractor shall be responsible for the repair of any damage caused by the Contractor or Subcontractors during the installation.
- B. Selective demolition may be necessary to facilitate installation of Communications Systems equipment and pathways. The Contractor shall obtain written permission from the Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings. After installation, Contractor shall restore floors, walls, roofs, and ceilings to their original condition.
 1. Avoid penetrations or installation of equipment onto or through waterproof assemblies such as roofs, exterior walls, and slab-on-grade floors. If installation cannot be avoided, install before waterproofing; protect installation area from weather/elements until sealing and waterproofing is complete.
 - a. Conduit and backboxes concealed or embedded in walls or floors may remain. Provide stainless steel cover over backbox openings that are not reused.
 2. Properly dispose of equipment and associated cabling, conduit, pathways and supports in compliance with local, state, and federal laws.

3.3 FUNCTIONAL AND PERFORMANCE TESTING

- A. After components have been installed, perform functional tests to ensure system components are installed and configured correctly in conformance with manufacturer's instruction and the Contract Documents. Correct any issues and retest. Include Test Report documentation in Preliminary and Final Project Closeout Submittals.
- B. Third-party testing or manufacturer onsite services may be necessary for certain Division 28 systems or sub-systems; refer to individual sections for exact requirements.
- C. Refer to individual sections for additional testing requirements.

3.4 FIELD OBSERVATIONS

- A. A minimum of two weeks in advance, notify Design Consultant and Owner as to the readiness for a Field Observation for the following:
 1. Rough-In Observation – after conduits have been installed, but before walls have been installed.
 2. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.
 3. Final Site Observation – a minimum of two weeks before Substantial Completion, to occur after Preliminary Project Closeout Submittal has been submitted.
- B. Non-Conforming Work

1. After receipt of written notice of defective Work, Contractor shall correct all defective Work, or, if the Work has been rejected by the Consultant, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages arising out of or relating to such correction or removal.

3.5 DEMONSTRATION, TRAINING, AND ADJUSTMENTS

- A. Conduct training sessions to Owner's personnel to demonstrate system operation and preventative maintenance procedures.
 1. Refer to individual sections for additional training requirements.
- B. After Owner has taken occupancy, Communications Systems equipment and components may require minor adjustments to be performed by the Contractor/Subcontractor to align with Owner's actual use of the systems. Refer to individual sections for specific adjustment requirements.

3.6 SOFTWARE, NETWORK, AND CYBERSECURITY REQUIREMENTS

- A. Software Requirements
 1. All firmware found in products furnished or provided by the Contractor shall be the latest and most up to date provided by the manufacturer.
 2. All equipment requiring users to log on using a password shall be configured with user/site-specific password(s). No system/product default passwords shall be allowed. Coordinate user logins and passwords with Owner prior to system setup.
 3. Refer to individual sections for additional software requirements.
- B. Network and Cybersecurity Requirements
 1. For all Communications Systems that have Contractor-provided equipment with an Ethernet/LAN port, Contractor shall coordinate with Owner's IT staff regarding Owner's network and cyber security requirements.
 2. As a part of the pre-installation meetings, the Contractor (and/or Subcontractors for each Communications System) shall request an IT Coordination Kickoff Meeting with Owner's IT staff to ascertain and document Owner's requirements. Contractor shall document this meeting and send meeting minutes to all parties in attendance as well as Consultant.
 3. At a minimum, coordinate the following network requirements for Contractor-provided equipment with the Owner's IT staff:
 - a. IP address quantities and assignments for each equipment type and location, including subnets and subnet masks.
 - b. PoE quantities and power requirements (PoE, PoE+, high powered PoE, etc.) for each equipment type and location.
 - c. Bandwidth requirements, including any prioritization or unicast/multicast requirements.
 - d. VLAN use and assignment.
 - e. Encryption requirements
 - f. WAN connection requirements
 - g. Tunnel requests for access through an Owner's network
 - h. Planned approach for software upgrades and security patching.
 - i. Follow additional network requirements and procedures as directed by the Owner's IT staff.

4. The Contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owner's technology infrastructure and network. These measures shall include but are not limited to:
 - a. The Contractor shall scan contractor-provided or furnished equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the equipment to the Owner's network.
 - b. Coordinate with the manufacturer to ensure newly procured equipment does not have any cybersecurity notices, bulletins, or alerts. Provide a letter to the Design Consultant with the submittal documents for that Specification section confirming there are no active or known cyber threats.
 - c. Ensure all installers/technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics.
 - d. The Contractor shall assess whether there are any cyber threats / vulnerabilities associated with the specified equipment, prior to procurement/installation. If cyberthreats are discovered, notify the Design Consultant within one Day. Provide the make and model of the associated equipment and the vulnerability.
 - e. Follow additional cybersecurity requirements and procedures as directed by the Owner's IT staff.
5. Refer to individual sections for additional Networking and Cybersecurity Requirements.

3.7 MAINTENANCE

A. Warranty Service

1. Pursuant to Contractor's General Warranty and Guarantee, Owner may request Warranty Service for a period of 1 year after Substantial Completion for Communications Systems components due to faulty material or installation.
2. Upon written notice from Owner, promptly perform remedial / corrective Work to bring the associated system(s) to compliance with the Contract Documents and satisfaction of the Owner.
 - a. In this context, "promptly" means within 7 Days, unless a quicker response and remediation time is specified in the associated Division 28 specification section.
3. Refer to individual sections for additional Warranty Service requirements.

B. One Year Warranty Check

1. Fifty weeks after Substantial Completion, Contractor or Subcontractor for each Division 28 section shall conduct a site visit with Owner's facility personnel to ensure systems and components are still operating as intended / required by the Contract Documents. Promptly perform corrective Work while on site or within 7 Days.
 - a. Pursuant to Contractor's General Warranty and Guarantee, corrective Work is not required if system / component is deficient due to:
 - 1) Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2) Normal wear and tear under normal usage.

C. On-Going Maintenance and Support

1. For each individual spec section and coordinating system installed, the supplying contractor shall provide a scope of work, including planning and costs, for supporting the installed systems.
 - a. Response time shall include the following:
 - 1) Initial response time to acknowledge Owner's request is four hours.

- 2) Expected time to be on site to support the Owner's request is eight hours.
- b. For any non-passive system provide a maintenance:
 - 1) An annual maintenance plan to service the equipment per the manufacturer's recommended operation.
 - 2) An annual test of the system to ensure the efficient operation, including coordination and report based on the Owner's request.

3.8 DRAWINGS AND SPECIFICATIONS AFTER SUBSTANTIAL COMPLETION

- A. Contractor and any Subcontractor or Supplier shall not:
 - 1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by Atlas Consulting, including electronic media editions; or
 - 2. Reuse any such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Atlas Consulting.
- B. The prohibitions in the paragraph above survive final payment, or termination of Contract. Nothing herein shall preclude Contractor or Owner from retaining copies of the Contract Documents for record purposes.
- C. Physical paper copies of Drawings and Specifications shall be properly destroyed (shredded) when no longer needed to perform the Work.

END OF SECTION 28 00 10

SECTION 28 10 00

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section identifies the requirements, technical design, and specifications for the Access Control System at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. The Access Control System, as specified, is an industry-standard access control system and includes an access control server, access control software, control panels, sub-controller panels, card readers, credentials, door position sensors, request to exit devices, cabling power supplies, and any associated software, hardware or licensing as specified.
- C. Contractor shall include materials, equipment, and labor necessary to provide a complete and functional turn-key access control system regardless of any items not listed or described in this specification or associated drawings.

1.2 RELATED REQUIREMENTS

- A. Work required by this Section shall meet the requirements of Division 0 & 1
- B. Refer to Division 26 for all pathway requirements

1.3 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. The Contractor shall possess all relevant Manufacturer Certifications for both the company and individual technicians prior to submitting a bid for the work.
 - 2. The Contractor shall have been in business for a minimum of five (5) years.
 - 3. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
 - 4. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
 - 5. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.
- B. Personnel Qualifications
 - 1. Project Manager/Quality Control Manager - At all times during the progress of the Work, Contractor (or Subcontractor) responsible for the Work of this Section shall assign a competent full-time employee (who shall be available for all on-site coordination meetings).

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- C. The Contractor shall possess all relevant Manufacturer Certifications (i.e. access control systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

1.4 SUBMITTALS

A. Pre-Bid

1. Refer to Division 28 00 10 for all specification deviation requests.
2. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section and Section 28 00 10 are met.

B. Bid

1. Unit Pricing
 - a. Provide unit cost to add/delete a single card reader location; inclusive of all cabling, equipment, labor, licensing, and miscellaneous associated costs.
2. Contractor and Personnel Qualifications
 - a. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section are met. Indicate quantity of full-time local technicians within one-hundred-mile radius of Project Site.
 - b. Also include list of three Contractor-installed projects of a similar size and scope that have been in operation for at least one year. Provide the following information for each project:
 - 1) Project Name and Location
 - 2) Project Start and Completion Dates
 - 3) Project Start and Completion Costs
 - 4) Brief Description of Project
 - 5) Client Point of Contact Name and Phone Number

C. Pre-Construction

1. Pre-Construction Submittal for this Section shall include the following:
 - a. Contractor Qualifications
 - 1) Certifications for Project Manager and all technicians expected to work on the Project.
 - 2) Documentation Contractor has been in business for at least five years.
 - 3) Address of Contractor's local office within one-hundred-mile radius of Project Site.
 - 4) Subcontractors – list sub-contractors performing any Work specified in this Section. List shall clearly identify the sub-contractor's legal name and address, the scope of work to be performed by the sub-contractor and the overall percentage of the Work being provided by the subcontractor. If there are no sub-contractors performing any Work, submit statement on company letterhead clearly indicating no sub-contractors will be performing any Work specified in this Section.
 - b. Bill-of-Materials
 - c. Product Data
 - d. Shop Drawings to include:
 - 1) Device locations
 - 2) Cable Type and Pathways
 - 3) Panel Termination Schedule

- 4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.
- 5) Naming Convention Information
- e. Structural Submittal – required for equipment over 200 pounds attached to overhead structure.

1.5 SUBMITTAL REQUIREMENTS

A. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Consultant.
2. The Contractor is responsible for notifying and obtaining written approval via RFI from the Consultant / Owner of any proprietary devices, software, and/or installation processes.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements. Including but not limited to:
 - a. A floor plan showing the location of the proposed locks.
 - b. The project name, address and associated building permit numbers, all posted on the floor plan.
 - c. The equipment installer name, business address and contact telephone number, all posted on the floor plan.
4. Contractor shall ensure submittals are submitted in 10 business days to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.

1.6 PROJECT CLOSEOUT

A. Preliminary Project Closeout submittal:

1. Submit the following a minimum of two weeks before Substantial Completion:
 - a. Memo/letter indicating that the Access Control Work is nearing completion and ready for the Final Site Observation by the Design Consultant.
 - b. Approved Shop Drawings or field Drawings with actual reader locations, cable pathways and labels, and head-end locations. BIM/CAD-produced drawings converted to PDF format. Provide 30"x42" laminated shop drawings, for each telecom room serving a given area.

B. Final Project Closeout submittal for this Section shall include the following:

1. Bill-of-Materials / Product Index – include column indicating any materials or equipment with a manufacturer's warranty longer than one year.
2. Product Data
3. Operation and Maintenance Data
4. Warranty Documentation
 - a. For any materials or equipment provided by the Contractor with a manufacturer's warranty longer than one year, include manufacturer documentation.
5. Record Drawings ("As-Builts")

1.7 COORDINATION

A. Coordination with other Divisions and Sections

1. Division 26
 - a. Coordinate head-end location power requirements and locations with Division 26 Contractor.
 - b. Coordinated all required relays and equipment for Fire Alarm, with installing contractor.
2. Section 27 10 00 Structured Cabling System
 - a. Coordinate all required Category 6A cabling required for system operation, with installing contractor.

B. Preinstallation Meeting / Coordination with Owner

1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Design Consultant, and Owner regarding Work specified in this Section.
 - a. This meeting is meant to:
 - 1) Review Scope of work, schedule, and escalation procedures.
 - 2) Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 - 3) Provide a Work schedule, including key commissioning dates for programming, as required for system operation.
2. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided.
- B. Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.
- C. Proposed equivalent items must be approved in writing by the Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.
- D. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.
- E. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- F. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

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- G. Original Equipment Manufacturer (OEM) documentation must be provided to the Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards where applicable.
 - H. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as per the project schedule.
 - I. Written approval must be obtained from the Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 ACCEPTABLE MANUFACTURERS

A. Access Control System Software

1. Lenel OnGuard

- a. Contractor shall verify at time of installation current version number and licensing information with Owner prior to procurement.
- b. Contractor shall include additional software and licensing as required for the following add-on modules:
 - 1) Active Directory Integration
 - 2) Data Import
 - 3) Badge Design and Printing
 - 4) Flex API
 - 5) Browser based web interface
 - 6) Mobile Application
 - 7) Cloud Software
 - 8) Video Management System (VMS) Integration

B. Access Control System Hardware

- 1. Access Control Database/File Server
 - a. Owner Furnished/Owner Installed
- 2. Access Control Application Server(s)
 - a. Owner Furnished/Owner Installed
- 3. Client Workstation(s)
 - a. Owner Furnished/Owner Installed
- 4. Access Control System Controller Boards
 - a. Intelligent Controllers – Head-End Controller
 - 1) Minimum of 64 doors total managed
 - 2) Minimum of 2 doors directly wired
 - 3) Minimum of 15MB on-board memory
 - 4) Approved Manufacturers:
 - a) Mercury LP1502
 - b) Or Approved Equal
 - b. Intelligent Controllers – Two-Door Controller
 - 1) Minimum of 2 doors directly wired
 - 2) Shall communicate with RS-485 bus
 - 3) Shall have a minimum of (8) inputs
 - 4) Shall have a minimum of (6) outputs

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- 5) Approved Manufacturers:
 - a) Mercury MR52-S3
 - b) Or Approved Equal
 - c. Input Board
 - 1) Minimum of 16 inputs
 - 2) Shall communicate with RS-485 bus
 - 3) Approved Manufacturers:
 - a) Mercury MR16IN-S3
 - b) Or Approved Equal
 - d. Output Boards
 - 1) Minimum of 16 outputs
 - 2) Shall communicate with RS-485 bus
 - 3) Approved Manufacturers:
 - a) Mercury MR16OUT-S3
 - b) Or Approved Equal
 - e. Interlock Controller – Typical
 - 1) Minimum of 2 doors managed
 - 2) Minimum of 2 door status inputs
 - 3) Minimum of 2 door rex inputs.
 - 4) Minimum of 2 LED connections for door status indication.
 - 5) Approved Manufacturers:
 - a) Dortronics
 - b) Or Approved Equal

2.3 END POINT DEVICES

- 1. Card Readers
 - a. Wall Mounted Reader
 - 1) Shall communicate Wiegand/OSDP
 - 2) Shall have 13.56MHz through DESFire EV2 capabilities with NFC
 - 3) Shall have 2.4GHz Bluetooth capabilities
 - 4) Shall have 125kHz capabilities
 - 5) Shall be UL294 listed
 - 6) Shall be powered via 12VDC
 - 7) Approved Manufacturers:
 - a) HID MultiCLASS RP 40
 - b) Or Approved Equal
 - b. Mullion Mounted
 - 1) Shall communicate Wiegand/OSDP
 - 2) Shall have 13.56MHz through DESFire EV2 capabilities
 - 3) Shall have 2.4GHz Bluetooth capabilities with NFC
 - 4) Shall have 125kHz capabilities
 - 5) Shall be UL294 listed
 - 6) Shall be powered via 12VDC
 - 7) Approved Manufacturers:
 - a) HID MultiCLASS RP10
 - b) Or Approved Equal
 - c. Wall Mounted Door Alarm
 - 1) Shall have a blue lens cover
 - 2) Shall provide a minimum of 100 decibels of sound output when activated
 - 3) Shall have 2.4GHz Bluetooth capabilities with NFC
 - 4) Shall be powered by 24VDC
 - 5) Approved Manufacturers:

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- a) Edwards 860 series
 - b) Or Approved Equal
2. Credentials
- a. Cards
 - 1) Shall allow for 125kHz and DESFire EV1
 - 2) Shall be white
 - 3) Shall read up to 4"
 - 4) Approved Manufacturers:
 - a) HID Combo 1451 Card
 - b) Or Approved Equal
- B. Buttons and Sensors
- 1. Recessed Mounted Door Position Switches
 - a. Shall be a maximum of 1" wide
 - b. Shall have a minimum of 12" lead
 - c. Shall be DPDT
 - d. Approved Manufacturers:
 - 1) GRI 199-12
 - 2) Or Approved Equal
 - 2. Request to Exit Device(s)
 - a. Integral with Electrified Door Hardware
 - 1) Reference Division 8 Finish Hardware Specifications and schedule for integral request to exit.
 - b. Motion Sensor
 - 1) Shall be wall or ceiling mounted
 - a) Shall include trim-plate
 - 2) Shall be capable of fail-safe/fail-secure
 - 3) Shall be white
 - 4) Shall be 12VDC
 - 5) Approved Manufacturers:
 - a) Bosch DS160
 - b) Or Approved Equal
 - 3. Door Release Button
 - a. Shall be SPDT
 - b. Shall be Momentary
 - c. Shall be Aluminum
 - d. Shall communicate up to 3A
 - e. Approved Manufacturers:
 - 1) Dortronics 5236-P15
 - 2) Or Approved Equal
 - 4. Duress Button
 - a. Shall come in metal enclosure
 - b. Button shall be red
 - c. Shall have a key-reset
 - d. Approved Manufacturers:
 - 1) Amseco HUSK-20
 - 2) Or Approved Equal
 - 5. Door Status Indicator
 - a. Shall have a red and green led indicator.
 - b. Shall be a 1-gang stainless steel plate.
 - c. Approved Manufacturers:
 - 1) Dortronics 7201 Series
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2) Or Approved Equal

C. Access Control Intercom Systems

1. Master Station
 - a. Minimum of 7" touchscreen
 - b. Integral handset
 - c. Integral MicroSD Slot
 - d. Shall be IP based
 - e. Approved Manufacturers:
 - 1) Aiphone IX-MV7-HB-L
 - 2) Or Approved Equal
2. Door Station – Mullion Mounted
 - a. Minimum of 5 lux IR
 - b. Minimum of IK08 and IP54 rated
 - c. Shall be IP based
 - d. Approved Manufacturers:
 - 1) Aiphone IX-DVM
 - 2) Or Approved Equal
3. Door Station – Flush Mounted
 - a. Minimum of 5 lux IR
 - b. Minimum of IK08 and IP54 rated
 - c. Shall be IP based
 - d. Approved Manufacturers:
 - 1) Aiphone IX-DVF
 - 2) Or Approved Equal
4. Door Relay – Wall Mounted
 - a. Minimum of 10 relay outputs
 - b. Minimum of 4 contact inputs
 - c. Shall be IP based
 - d. Approved Manufacturers:
 - 1) Aiphone IXW-MAA
 - 2) Or Approved Equal

D. Access Control System Power Supplies

1. Enclosed Products
 - a. Contractor to refer to device schedules and system requirements for sizing and quantity of boards in the enclosed power supply.
 - b. Intelligent Power Controllers:
 - 1) 12/24 VDC Power Supply(s)
 - 2) Managed Relay Module(s)
 - 3) Power Distribution Module(s)
 - 4) Network Module
 - 5) Circuit Breaker Switch
 - 6) Integral Finger Duct
 - 7) Low Battery Disconnect Module Shall include integral fire alarm connection points
 - 8) Approved Manufacturers:
 - a) Altronix Trove
 - b) LifeSafety Power
 - c) Or Approved Equal

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- E. Uninterruptible Power Supplies / Battery Backup
1. ACS Enclosure Battery Backup
 - a. Shall be lead-acid
 - b. Shall be rated for 12V at 12Ah
 - c. Shall be rechargeable
 - d. Approved Manufacturers:
 - 1) Yuasa
 - 2) Or Approved Equal
- F. Electrified Locking Mechanisms
1. Reference Division 8, for electrified locking hardware and associated connections.
- G. Surge Protection
1. Exterior Card Readers
 - a. Shall have a single ground point
 - b. Shall arrest up to 2,000A
 - c. Shall be capable of OSDP/Wiegand
 - d. Approved Manufacturers:
 - 1) Ditek DTK-xLVL Series
 - 2) Or Approved Equal
- H. Access Control System Cabling
1. Door Hardware Cabling
 - a. Composite Cable with Overall Jacket
 - 1) Shall be plenum rated
 - 2) Shall be purple
 - 3) Approved Manufacturers:
 - a) Windy City Wire 4ELEMP-PUR-500
 - b) Or Approved Equal
 2. Peripheral Device Cables
 - a. REX, Door Position Switches, Relays
 - 1) Shall be plenum rated
 - 2) Shall be purple
 - 3) Shall be unshielded
 - 4) 18 AWG/2C
 - 5) Approved Manufacturers:
 - a) Windy City Wire 1802P-PUR
 - b) Or Approved Equal
 - b. Buttons and Releases
 - 1) Shall be plenum rated
 - 2) Shall be white with purple stripe
 - 3) Shall be unshielded
 - 4) 22 AWG/2C
 - 5) Approved Manufacturers:
 - a) Windy City Wire 2202P-WHT-PUR
 - b) Or Approved Equal
 3. Exterior Card Reader
 - a. Shall be OSP rated
 - b. Shall be black
 - c. Shall be shielded

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- d. 18 AWG/6C
 - e. Approved Manufacturers:
 - 1) Windy City Wire 1806SDB-WBT-BLK
 - 2) Or Approved Equal
 - 4. Exterior Devices
 - a. Shall be OSP rated
 - b. Shall be black
 - c. Shall be non-shielded
 - d. 18 AWG/6C
 - e. Approved Manufacturers:
 - 1) Windy City Wire 1806DB-WBT-BLK
 - 2) Or Approved Equal
 - I. Pathway Cable Support
 - 1. Power Supply Enclosures:
 - a. Minimum holding capacity of 10lbs
 - b. Shall be UL listed
 - c. Shall have magnetic backing
 - d. Approved Manufacturers:
 - 1) Altronix
 - 2) Or Approved Equal
 - 2. J-Hooks
 - a. Shall be listed as meeting UL 2239 requirements
 - b. Plenum-rated
 - c. Shall be designed and equipped with accessories (if needed) to be supported by the following methods:
 - 1) Threaded rod from structure
 - 2) Wall-mounted to concrete/CMU walls or wood or metal studs
 - 3) Beam clamps
 - 4) Optional "multi-tiered" mounting to bottom of J-hook
 - 5) Optional Fastener to raised floor pedestal
 - d. Equipped with retainer or strap over top of J-hook once cables are installed
 - e. Sized to support quantity of installed cables, plus 25% spare capacity
 - f. Approved Manufacturers:
 - 1) Caddy
 - 2) Panduit PanNet
 - 3) Tomarco Series 200
 - 4) Or Approved Equal
 - J. Labeling
 - 1. Permanent Labels for Copper Cables
 - a. Panduit Self-Laminating Labels
 - b. Or Approved Equal
 - K. Sealants
 - 1. Exterior Device Sealants
 - a. Shall be UL Listed
 - b. Shall have a minimum tensile strength of 350psi
 - c. Shall be rated STC44
 - d. Approved Manufacturers:
 - 1) Masterseal NP1
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2) Or Approved Equal

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
 - 2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
 - 4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Building Industry Consulting Service International (BICSI)
 - 1. Telecommunications Distribution Methods Manual
- E. Outside Plant Design Reference Manual
- F. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
- G. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
- H. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- I. Federal Communications Commission (FCC)
 - 1. FCC Part 15, Radiated Emissions Limits, revised 1998
 - 2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
 - 3. FCC Part 76, Cable Television Service, revised 1998
- J. Insulated Cable Engineers Association (ICEA)
 - 1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
 - 2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
 - 3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors
- K. International Electrotechnical Commission (IEC)
- L. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 - 1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System

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2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
 3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
 5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms
- M. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
 2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
 4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
- N. National Cable Television Association (NCTA)
- O. National Electrical Contractors Association (NECA)
1. NECA-1 2015 Good Workmanship in Electrical Construction
- P. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
- Q. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
 2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
 3. NFPA-101, Life Safety Code
 4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
 5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
- R. National Institute Standards and Technology (NIST)
- S. Occupational Safety and Health Administration (OSHA)
- T. Security Industry Association (SIA)
- U. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
 2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
 3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
 4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
 5. ANSI/TIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
 6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
 7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
 8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

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- V. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
 2. RUS Bull 1751F-643 (2002) Underground Plant Design
 3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
 4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
 5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
 6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
 7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
 8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
- W. Underwriters Laboratories, Inc. (UL)
1. UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
 2. UL 910 (NFPA 262 1990) Applicable Flame Test

3.2 GENERAL REQUIREMENTS

- A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Consultant for direction before proceeding with that part of the work.
- B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.
- C. The Contractor shall be responsible for coordination with other trades to ensure any conflicts or potential conflicts are resolved prior to any work beginning on the project.
- D. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines.
- E. No deviations from the plans or specifications shall be made without full consent in writing of the Consultant. The Contractor shall have written approval from the Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.
- F. The Contractor shall obtain written permission from the Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to, girders, beams, floors, walls, roofs, or ceilings.
- G. Contractor shall notify the Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

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- H. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
 - I. Equipment and materials installed by the Contractor shall be free of defects and damage.
 - J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.
 - K. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.
 - L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Consultant.
 - M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
 - N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.
 - O. Contractor shall make all stored equipment and materials available for inspection at the request of the Consultant.
 - P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.
 - Q. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
 - R. Contractor shall be responsible to properly protect any field installed devices/cabling from damage by other trades during construction.
 - S. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.
 - T. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.
 - U. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:
 - 1. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e. servers, and other associated equipment.

3.3 COORDINATION REQUIREMENTS

- A. Contractor is responsible for coordinating with Division 8 contractor for the following:
 - 1. Door hardware manufacturer installation and power requirements.
 - 2. Installation, power and requirements for integral request to exit switches.
- B. Contractor is responsible for coordinating with Division 26 (Fire) for door hardware manufacturer installation and power requirements.
- C. Contractor is responsible for coordinating with Division 26 for the following:
 - 1. Pathways and high voltage power, grounding and bonding requirements.
 - 2. All in-wall, surface mount, and underground pathways and rough-in devices.
- D. The contractor is responsible for coordinating with Division 27 for the following:
 - 1. Installation and power requirements of network infrastructure tied to security systems.
 - 2. Verify the location, power and backup requirements of each piece of rack mounted equipment with the Owner/Consultant prior to installation.
- E. The contractor is responsible for coordinating ACS locations and mounting preferences of all specified security devices with the Consultant prior to installation.
- F. Programming and data entry to be provide by the Contractor unless otherwise noted. Contractor shall coordinate with the Owner to program the Access Control System to provide the following basic functions included but not limited to:
 - 1. Database Importing (Active Directory, CSV file, etc.)
 - 2. Graphics Maps
 - 3. Time zones
 - 4. System Reports
 - 5. Threat / Emergency Management Protocols (Lockdown, Severe Weather, etc.)
 - 6. Role Based User System Access (Admin, User Privileges, etc.)
 - 7. Access levels (Areas, User Groups, etc.)
 - 8. Schedules (Lock/Unlock, Auto Arm/Disarm, etc.)
 - 9. Auxiliary I/O Devices (Sirens, Strobes, Buzzers etc.)
 - 10. Door Configuration Settings to include but not limited to:
 - a. Anti-Pass Back
 - b. Door Release via Push Button Input
 - c. Door Release via Request to Exit (Maglock ONLY)
 - d. Door Forced / Door Held Alarms Conditions
 - e. ADA Door Settings
 - 11. Special Conditions (Fire Alarm Relays, Hold Opens, Elevators, Gate / Door Operators, etc.).
- G. Coordinate finishes and colors of all equipment with the Owner. Submit all finish and graphics for all equipment in public areas to the Consultant for approval prior to installation.

3.4 SYSTEM REQUIREMENTS

- A. General

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1. The Access Control System (ACS) shall consist of software, licensing, doors controllers, access control cabling, credentials and all other peripheral components as indicated on the drawing and specified herein.
 2. Any devices associated with the installation shall have the latest firmware updates downloads via owner approved secure link from the system software and/or remotely from the manufacturer.
 3. The Contractor shall size all equipment accordingly based on the parameters specified herein and in the device schedules.
 4. All Access Control software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.
- B. Communications
1. Communication between servers, and workstations, networked based controllers/sub-controllers will communicate using the Owner provided data network unless otherwise noted.
 2. The ACS shall also support end to end 128-bit encryption unless otherwise noted.
 3. Network device communications shall be via the Separate Security LAN via network cabling as specified by Division 27 (where applicable).
 - a. Contractor shall coordinate with owner for addressing requirements
- C. Access Control System (ACS) Software
1. Application / Client Workstation Software
 - a. The ACS software installed shall be the most current version; Contractor shall coordinate with Owner prior to the upgrade/install to identify and evaluate any software conflicts. Conflicts shall be brought to the attention of the design team prior to bidding via Request for Information (RFI).
 - b. Contractor shall coordinate with the Owner to install and configure software on workstation(s) as required to provide a full turnkey ACS system.
- D. Access Control System Licensing
1. Contractor shall be responsible for providing and applying all necessary licensing key(s) for the specified system(s) as required by the manufacturer(s) for a fully functioning access control system.
 2. Contractor shall maintain a secured document with all license key(s) information applicable to this project. All license key(s) are property of the owner and shall be kept secured at all times and then surrendered to the Owner at the end of the project.
- E. Access Control System Controller(s)
1. Install Controller(s) in designated locations as indicated on drawings
 - a. The Controller(s) shall be wall mounted in the ACS manufacturer's UL listed enclosure, unless a separate manufacturer enclosed power supply solution is specified that is specifically designed for the controller board(s) specified herein. The enclosure shall consist of the following
 - 1) Single cover, hinged, with identical key cylinder lock(s) for all enclosure(s). Hinged double doors will not be accepted.
 - 2) Contractor shall furnish, install, and connect tamper switch for all enclosure(s) to the controller(s) as specified. One alarm input is needed per Server / Data Rooms to alarm via the ACS system when the enclosure is opened.

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- 3) Contractor shall furnish, install, and connect Battery Fail / Power Loss alarm inputs to the controller(s) as specified. One alarm input is needed per Server / Data Rooms to alarm via the ACS system in the event of low battery / power loss conditions.
 - 4) Enclosure(s) shall be mounted flush, plumb, and properly secured on fire-rated plywood using appropriate mounting hardware. Pathways to or from the enclosure(s) shall mechanically protected in a conduit or gutter system. Exposed cabling is not permitted.
 - b. Architecture
 - 1) For every 60 doors provide a head-end controller, extend the RS-485 bus into each Door Controller.
 - 2) Head-End Controller
 - 3) Door Controller shall be fed by Head-End Controller through the RS-485 bus.
 - a) Each associated device at the door, shall connect to the designated Input/Output on the Door Controller.
 - 4) Input/Output Boards
 - a) All required connections on doors without readers shall be routed to dedicated Input/Output boards, connected to the Head-End Controller from the RS-485 bus.
 - c. Device power shall be provided from a UL listed power supply or PoE powered network switch where required in accordance with the manufacturer's requirements.
 - d. Controller(s) shall be installed per the construction documents.
 - e. Controller(s) shall be installed and configured in accordance with the most current manufacturer installation instructions.
 - f. The installation shall be performed or directly supervised by a manufacturer-certified technician.
 - 1) The term "supervised" means the certified technician shall be on-site and supervising the installation.
 - 2) The certified (on-site) technician shall have a copy of the manufacturer certification on-site readily available for review.
 - 3) The manufacturer certification shall be current and valid.
 - g. Sufficient modules shall be provided to accommodate only the number of card readers initially installed. Enclosure, head-end controller, and card reader controllers shall be sized to allow for growth as required. (10% Minimum)
- F. Access Control System Interlock Controller(s)
1. Install interlock Controller(s) in designated locations as indicated on drawings
 - a. The Controller(s) shall be wall mounted in the manufacturer's UL listed enclosure, unless a separate manufacturer enclosed power supply solution is specified that is specifically designed for the controller board(s) specified herein. The enclosure shall consist of the following
 - 1) Single cover, hinged, with identical key cylinder lock(s) for all enclosure(s).
 - 2) Integrated system power supply.
 - b. Interlock controllers shall be powered by the emergency power circuit.
 - c. The controller operation shall provide the following sequence of operation.
 - 1) Only a single door to be unlocked or open at the same time.
 - 2) Unlocking or opening one door shall automatically secure the other doors within the interlock.

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- 3) A request for access at any normally locked door will inhibit the request-to-exit inputs for all other locked doors and secure all designated unlocked doors within the interlock.
 - 4) For user feedback, designated red/green LED outputs shall display lock status or door availability.
- G. Access Control System Credential Readers (Cards, Vehicle Tags, PIN, Biometric)
1. Unless otherwise stated, all card readers shall be wired Wiegand
 2. Provide credential reader(s) as indicated on the drawings.
 3. Readers shall be securely mounted flush and plumb on the wall/mullion per the manufacturer installation guidelines.
 4. Exterior credential readers shall have surge suppression provided.
 5. Exterior credential readers shall be installed with a weather-proof gasket as recommended by the manufacturer.
 6. Exterior credential readers mounted on gates or vehicle pedestals shall be securely mounted in a NEMA rated weather-proof enclosure.
 7. Where a weather-proof gasket is not sufficient for weather-proof protection, a polyurethane sealant for exterior use shall be applied.
 8. Readers shall be installed with the manufacturer provided tamper-proof security fasteners, unless otherwise approved in writing by Consultant. If tamper-proof security fasteners are not provided, the contractor is responsible for procuring the requested hardware at no cost to the owner.
- H. Access Control System Credentials (Cards, Vehicle Tags, PIN, Biometric)
1. Provide a total of 100 specified credentials.
 - a. Coordinate all required sequential numbers with Owner, prior to ordering.
- I. Electrified Door Hardware Mechanical Connections
1. Contractor shall conceal security cabling in door frame, door channels, walls wherever possible. Submit RFI if site conditions do not allow and propose alternative methods of terminations.
 2. The Division 28 Contractor shall not make any modifications to fire rated doors without obtaining written permission from the Consultant.
 3. The Division 28 Contractor is responsible for providing the following:
 - a. Provide relay signal cabling only from the ACS to the Division 8 power supply or relay board(s) located either at the door or centralized location
 - b. Termination of Lock Relay Power for PoE based networked door controllers up to the electrified door hardware / transfer hinge connection point
 - c. Device power provided by Owner-provided PoE networked switch.
- J. Electrified Locking Mechanism Power Supply
1. Provided by above referenced Access Control Power Enclosure unless otherwise noted.
 2. Power supplies specified herein are intended for low amperage inrush (≤ 1 Amp) devices only. "High Amp Inrush" or devices with inrush currents over 1 amp and their associated power supplies shall be specified and provided by others, unless otherwise noted.
 3. Contractor to perform Amperage load calculations to ensure combined power draw of electrified door hardware and access control devices does not exceed the maximum output of the power supply as recommended by the manufacturer while also allowing room for future growth.
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4. Contractor to perform Voltage Drop calculations to ensure the location of each electrified door power supply is within the maximum distance allowed based on voltage, wire gauge and distance from the power supply to each door location.
 - a.

 - K. Door Position Sensors (Door Contacts, Tamper Switches)
 1. Provide magnetic concealed door position switches, surface mount door position switches and overhead door position switches to monitor the open/closed status of doors as specified herein and as indicated on the drawings.
 2. The contractor shall ensure the circuit of the door position sensor shall match the physical status of the door opening i.e. Normally Closed when the door is closed.
 3. Exterior mounted door position sensors shall terminate using the appropriate outdoor-rated weatherproof connections and fasteners based on site conditions.
 4. Provide flexible metallic conduit (as required) from the sensor location to the associated junction box as indicated on the drawings. Conduit shall be securely fastened to the structure using proper fasteners based on site conditions.
 5. Contractor must ensure adequate spacing between contact and magnets to avoid abrasion / damage to the device.
 6. Install end of line resistors for line supervision. Refer to manufacturer for recommended resistance values
 7. Tamper shall be mounted inside the enclosure on key switch side.

 - L. Request-to-Exit
 1. For doors equipped with electric locking mechanical that are free exiting at all times (i.e. mortise electric locks, electric strikes, etc.), the REX motion sensor shall only shunt the door position sensor from the Access Control System unless otherwise noted.
 - a. Integrated in Electrified Door Hardware
 - 1) Security Contractor shall route cable from door controller to access controlled door as indicated on the drawings and terminate the specified cable to the top of the Division 8 installed Electrified Power Transfer Hinge.
 - a) At the time of installation of the door hardware, The Security Contractor shall provide and install all end of line resistors required by the ACS System Manufacturer.
 - b) Security Contractor shall not remove Division 8 Installed Door Hardware unless otherwise approved in writing by the Consultant.
 - b. Request-to-Exit Motion Sensor
 - 1) Motion sensor shall be mounted flush, plumb, and properly secured on a single gang box or mechanical brace using appropriate mounting hardware and trim plate.
 - 2) Motion sensors shall be positioned close to the door opening and angled to prevent tampering from forced entry. Contractor shall ensure devices mounted in the ceiling space are not obstructed or impacted when servicing in relation to other ceiling mounted devices (Exit signs, smoke detectors, lighting fixtures, etc.)

 - M. Push Buttons (Door Release / Emergency / Duress / Etc.)
 1. Provide desk-mounted or wall mounted personnel duress alarms with normally closed alarm output contacts as indicated on the drawings.
 - a. Coordinate final mounting locations of each button with Owner/Consultant prior to installation. Any obstructions or conflicts shall be identified in writing.
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- b. Security device cabling installed in the knee space shall be mechanically protected with an armored flex from the rough-in back box to the edge device as scheduled. No exposed cabling is permitted.
 - c. Buttons installed in under knee spaces shall be mounted facing perpendicular to the opening, to avoid accidental activation.
 2. Door Release buttons shall be wired and configured to momentarily unlock the associated door as indicated on the drawings and schedule.
 3. Designated Emergency Release Buttons shall be installed and configured to perform the following functions including but not limited to:
 - a. Momentary release of designated door when button is pressed
 - b. Indicate alarm condition on the Access / Video Surveillance system and pull up live video feed of the nearest camera (if required)
 - c. Disable use of the button until the alarm condition is cleared to avoid unauthorized entry.
 - N. Access Control Intercom Systems
 1. Provide IP Audio / Video Intercoms door station and master stations as specified.
 2. Coordinate importing and recording of Intercoms to the Owner's VMS.
 3. Unless otherwise noted, intercoms shall dial back to the security control center upon activation.
 4. In locations where a master station handset is installed, the intercom shall dial directly to the associated handset first before dialing out to the security control center.
 5. Door Release via the ACS shall be initiated through programming and relay cabling from the intercom / intercom master station to the associated door relay board. Refer to manufacture installation guide for wiring diagram.
 - O. Access Control System Power Supplies and Power Distribution
 1. Unless otherwise noted, all power supplies shall be hardwired to the 120VAC circuit. No pigtails / plugs shall be acceptable.
 2. Enclosed Wall Mounted Access Control Panel Power Supply
 - a. The Security Contractor shall provide and install devices as indicated on the drawings.
 - b. Security Contractor shall refer to Division 8 Finish Hardware schedules and system requirements for sizing and quantity of boards in the enclosed power supply.
 - c. The Security Contractor shall provide and install Power Control Modules as specified.
 - 1) Each Lock power output cable shall be terminated to a dedicated port on the Power Distribution Module specified.
 - d. The Security Contractor shall provide and install Power Distribution Modules as specified.
 - 1) Each request-to-exit motion (where required) cable shall be terminated on a dedicated port on the Power Distribution Module.
 - e. The Security Contractor shall size each enclosure(s) with power supplies as specified to include an additional total amperage of at least 20% additional maximum amperage output per enclosure for future expansion as required.
 - P. Backup Battery(s)
 1. The Security Contractor shall provide and install one (1) back up battery for each 12 VDC power supply and two (2) back up batteries for each 24 VDC power supply per each power supply enclosure.
 2. The Security Contractor shall label the install date for each battery with printed labels.
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3. For large installations where batteries do not fit in the provided enclosure, the Contractor shall provide a separate battery enclosure to house all necessary back up batteries.

Q. Access Control Cabling

1. Pathways
 - a. Wires shall be routed utilizing the pathways as indicated in the technology drawings. Reference Division 28 05 33 specifications for additional requirements.
 - b. Access control cabling shall be routed separate from the network data communication cables specified in Division 27. Contractor shall provide separate pathways and j-hooks for the cables specified herein unless otherwise noted.
2. Wiring Techniques
 - a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
 - b. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.
 - c. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored at the access control panel.
 - d. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored on the wall above the ladder rack in the regional MDF / IDF room(s).
 - e. Install code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.
 - f. All wire and cable shall be continuous from device location to the final point of termination ("Home Run"). No mid-run cable splices shall be allowed.
 - g. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.
 - h. Neatly bundle and wrap all horizontal / vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide supports as required. All supports shall be UL listed for the application.
 - i. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.
 - j. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.
3. Splices / Transitions
 - a. Home run cabling is the preferred method of installation for all Access Control System devices and panels.
 - b. In the unlikely event that a splice or transition is required, the Contractor shall identify all splices / transition points required for the completion of the project and confirm, in writing, in advance, via RFI with the Consultant for acceptance of the proposed wiring techniques to be utilized.

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- c. By not submitting an RFI, Contractor acknowledges that no major splicing is required for the completion of this project. Any splices not previously identified that are found to be faulty shall require the Contractor to re-install the affected cable in its entirety at no cost to the Owner.
 - d. Contractor shall clearly mark splices / transition points on the shop drawings and As-Built drawings as part of the project close-out.
4. Cable Dressing
- a. No excessive cable slack shall be left in enclosures.
 - b. Cables shall be dressed in a professional manner
 - c. Cables shall be routed in 90-degree angles to termination points inside enclosures.
 - d. Ty raps / zip ties are not permitted, hook and loop / Velcro is acceptable.
 - e. Exposed wires are not acceptable
 - f. Enclosures and equipment / Telecommunication room shall be left clean without debris including but not limited to labels, connectors, screws, etc.
 - g. All spare / unused cables shall be in the enclosure shall be neatly coiled and protected to avoid any shorts to ground.
- R. Labeling
- 1. Contractor shall verify room numbers and confirm the final room numbering scheme and Owner's current standard in writing in advance via RFI prior to generating any labels.
 - 2. Cables overall sheath shall be labeled within (6) inches from the point the cable enters/exits the enclosure inside the Equipment Room / Telecommunications / Security Control Location Rooms.
 - 3. Cables shall be labeled within (1) inch from the termination point inside the Equipment Room / Telecommunications / Security Control Location Rooms.
 - 4. Cables shall be labeled within (1) inch from the termination point at the device end.
 - 5. Cables shall be labeled identically at both ends.
 - 6. Label all controls as necessary to agree with their function.
 - 7. All labeling in the field shall match the same labeling scheme in the closeout documents.
- S. Fire Stop
- 1. Use proper sealant as recommended by the manufacturer for the specific application in compliance with per all applicable codes: City, State, Federal, Authority Having Jurisdiction (AHJ).
 - 2. All existing pathways shall be resealed in compliance with per all applicable codes: City, State, Federal, AHJ.
- T. Grounding and Bonding
- 1. The Contractor shall ensure metal-to-metal contact for all grounding terminations.
 - 2. All materials shall be UL Listed.
 - 3. All connections shall be made with UL Listed compression 2-hole lugs.
 - 4. Contractor shall use an anti-oxidation compound on all connections.
 - 5. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.
- U. Conduit, Boxes and Raceways (For Reference Only - By Division 26)

1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring's, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.
3. All conduits shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in, and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Consultant.

V. High Voltage (120VAC) Power Requirements (For Reference Only – by Division 26)

1. 120VAC AC power dedicated to security shall be provided by the electrical contractor for the Access control system as indicated on drawings. Coordinate with the Consultant to establish locations of security dedicated 120VAC AC circuits.
2. Connect to the AC power (provided by electrical contractor) and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.
3. Provide all conduit and wiring from the AC power facilities to the Access Control / Power Supply Enclosures.
4. Provide Mechanical separation to isolate 120VAC wires from other low voltage cabling. Low voltage cabling shall not route over/under/parallel to 120VAC wires.

W. Surge Protection / Lightning Arrestors

1. Protect all exterior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 TESTING REQUIREMENTS

A. System Start-Up

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1. The Work shall be complete and ready to operate prior to final acceptance.
 2. The Consultant shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.
- B. Substantial Completion
1. In order to qualify for the Consultant's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
 - a. Installation of all devices must be completed.
 - b. All sub-system interfaces must be complete and operational.
 2. Substantial Completion shall not be construed as final acceptance of the Work.
- C. System Acceptance
1. Final acceptance testing of the Work will be conducted by the Owner/Consultant.
 2. Before system acceptance testing, Security Contractor shall conduct a complete in-house QA/QC test of the entire Access Control System and provide a written report on the results of that test. During the QA/QC test the Security Contractor shall place the ACS in service mode and calibrate and test all equipment.
 3. Prior to the final acceptance test, coordinate with the Consultant for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery and all surplus materials.
 4. The Contractor shall submit two sets of preliminary (draft) Record Drawings to the Consultant. The preliminary Record Drawings are to be used by the Consultant to conduct the system final test.
 5. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Access control system functions by placing it in near real operating conditions. During this period, the Access control system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
 6. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Consultant that the installed complete Access control system has been calibrated, tested, and is fully functional as specified herein.
 7. Upon written notification from the Contractor that the Access control system is completely installed, integrated and operational, and the burn-in testing completed, the Consultant will conduct a final acceptance test of the entire system.
 8. During the final acceptance test by the Consultant, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Access control system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Access control system head-end equipment will be evaluated.
 9. The functionality of the various interfaces between systems will be tested.

10. Following the Access control system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Consultant or Owner, at no charge to the Consultant or Owner.
12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Consultant will issue a letter of final acceptance.
13. The Consultant retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/ Consultant's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Consultant with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs or modifications to the system will be conducted without the permission of the Consultant.

3.6 TRAINING REQUIREMENTS

- A. Provide for (8) hours of training for five (5) persons on each system.
- B. Provide a test report showing the system has been 100% tested and 100% operational prior to training / demonstration.
- C. Coordinate with the Owner to establish a training outline and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.
- D. Contractor training shall be conducted onsite/virtually with a manufacturer's representative in attendance.
- E. Operator training shall include, but not be limited to the following:
 1. All operating procedures and graphic user interface (GUI)
 2. System configuration
 3. Alarm acknowledgement, alarm response logging, and map graphics functionality
 4. Image capture, badge printing, and print ribbon replacement.
- F. Administrative training shall include, but not be limited to the following:
 1. All operating system procedures, configuration variables and graphic user interface (GUI)
 2. Database functions and setup
 3. Cardholder input and deletion procedures
 4. Report generation

5. Card format configuration
 6. Badge creation and design
- G. Record, label, and catalog all training and “user’s manual” written specifically for the Owner personnel onsite, for daily routine operations of the systems. Provide the user’s manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.
- H. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested until the total number of training hours has been completed.

3.7 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings

1. Drawings shall be provided to the Owner/Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Owner/Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Owner/Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the access control system as installed to include but not limited to:
 - a. ASI, PR and Addendum items installed throughout the duration of the project.
7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Access Control System enclosure. Coordinate with Owner for final storage location.
8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
 - a. Access Control System Riser / Signal Flow Diagrams
 - b. Access Control System Backboard Layouts
 - 1) To include access control boards, power supplies, pathways, etc.
 - c. Sleeves, Backbone Cabling and Communication pathways
 - d. Access Control System device locations and labeling scheme.

B. Operation & Maintenance Manuals

1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer’s Product Warranty

1. Certificate of product warranty shall be provided to the Owner/Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Consultant.

2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
 3. One original and two copies of the Manufacturer's product warranty shall be provided.
- D. Contactor's Statement of Warranty
1. Statement of warranty shall be provided to the Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Consultant.
 2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
 3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 10 00

SECTION 28 20 00
VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section identifies the Requirements, Technical Design, and Specifications for the Video Surveillance at the Mental Health Extended Observation Unit, located in La Marque, Texas, ("Owner").
- B. The Video Surveillance System as specified is an industry-standard and includes Video Surveillance server(s), video surveillance cameras, surge protection devices and mounting hardware as specified.
- C. It is the Contractor's responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions.

1.2 RELATED REQUIREMENTS

- A. Work required by this Section shall meet the requirements of Division 0 & 1 work requirements
- B. Refer to Division 26 for all pathway requirements
- C. 28 00 10 – General Requirements for Physical Security
- D. 28 10 00 – Access Control System
- E. 27 05 33 – Pathways for Communications Systems

1.3 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. The Contractor shall possess all relevant Manufacturer Certifications for both the company and individual technicians prior to submitting a bid for the work.
 - 2. The Contractor shall have been in business for a minimum of five (5) years.
 - 3. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
 - 4. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
 - 5. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.
- B. Personnel Qualifications

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1. Project Manager/Quality Control Manager - At all times during the progress of the Work, Contractor (or Subcontractor) responsible for the Work of this Section shall assign a competent full-time employee (who shall be available for all on-site coordination meetings).
- C. The Contractor shall possess all relevant Manufacturer Certifications (i.e., hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.
- 1.4 SUBMITTALS
- A. Pre-Bid
1. Refer to Division 28 00 10 for all specification deviation requests.
 2. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section and Section 28 00 10 are met.
- B. Bid
1. Unit Pricing
 - a. Provide unit cost to add/delete a camera of each specified type; inclusive of all equipment, labor, licensing, and miscellaneous associated costs.
 2. Contractor and Personnel Qualifications
 - a. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section are met. Indicate quantity of full-time local technicians within one-hundred-mile radius of Project Site.
 - b. Also include list of three Contractor-installed projects of a similar size and scope that have been in operation for at least one year. Provide the following information for each project:
 - 1) Project Name and Location
 - 2) Project Start and Completion Dates
 - 3) Project Start and Completion Costs
 - 4) Brief Description of Project
 - 5) Client Point of Contact Name and Phone Number
- C. Pre-Construction
1. Pre-Construction Submittal for this Section shall include the following:
 - a. Contractor Qualifications
 - 1) Certifications for Project Manager and all technicians expected to work on the Project.
 - 2) Documentation Contractor has been in business for at least five years.
 - 3) Address of Contractor's local office within one-hundred-mile radius of Project Site.
 - 4) Subcontractors – list sub-contractors performing any Work specified in this Section. List shall clearly identify the sub-contractor's legal name and address, the scope of work to be performed by the sub-contractor and the overall percentage of the Work being provided by the subcontractor. If there are no sub-contractors performing any Work, submit statement on company letterhead clearly indicating no sub-contractors will be performing any Work specified in this Section.
 - b. Bill-of-Materials

- c. Product Data
- d. Shop Drawings to include:
 - 1) Camera Device Type & Locations
 - a) Pathways required for installation
 - 2) Mount Type
 - 3) Elevation and Topography Drawings to illustrate the associated devices and equipment and the heights at which they will be installed.
- e. Camera and equipment schedules shall include at a minimum but are not limited to:
 - 1) Device
 - 2) Device Power Requirements
 - 3) Telecommunications Room
 - 4) Rack
 - 5) Network switch
 - 6) IP addresses
 - 7) Patch panel
 - 8) Surge/lighting protection
 - 9) Power source

1.5 PROJECT CLOSEOUT

A. Preliminary Project Closeout submittal:

- 1. Submit the following a minimum of two weeks before Substantial Completion:
 - a. Memo/letter indicating that the work is nearing completion and ready for the Final Site Observation by the Design Consultant.
 - b. Approved Shop Drawings or field Drawings with actual reader locations, cable pathways and labels, and head-end locations. BIM/CAD-produced drawings converted to PDF format. Provide 30"x42" laminated shop drawings, for each telecom room serving a given area.
 - c. Final Project Closeout submittal for this Section shall include the following:
 - 1) Bill-of-Materials / Product Index – include column indicating any materials or equipment with a manufacturer's warranty longer than one year.
 - 2) Product Data
 - 3) Operation and Maintenance Data
 - 4) Warranty Documentation
 - a) For any materials or equipment provided by the Contractor with a manufacturer's warranty longer than one year, include manufacturer documentation.
 - 5) Record Drawings ("As-Builts")

1.6 COORDINATION

A. Coordination with other Divisions and Sections

- 1. Division 26
 - a. Coordinate head-end location power requirements and locations with Division 26 Contractor.
- 2. Section 27 10 00 Structured Cabling System
 - a. Coordinate all required Category 6A cabling required for system operation, with installing contractor.

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- B. Preinstallation Meeting / Coordination with Owner
1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Design Consultant, and Owner regarding Work specified in this Section.
 - a. This meeting is meant to:
 - 1) Review Scope of work, schedule, and escalation procedures.
 - 2) Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 - b. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. The following sections specifically list the acceptable equipment types and items for this project.
- B. Unless otherwise stated, all wiring, equipment, and installation materials shall be commercial grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.
- C. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided.
- D. Consultant/Owner will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.
- E. Proposed equivalent items must be approved in writing by the Consultant/Owner prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.
- F. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.
- G. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.
- H. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- I. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.
- J. Original Equipment Manufacturer (OEM) documentation must be provided to the Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA standards where applicable.
- K. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Consultant/Owner.

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- L. Written approval must be obtained from the Consultant/Owner for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 ACCEPTABLE MANUFACTURERS

A. Video Management System

- 1. Acceptable Manufacturers:
 - a. Video Insight
- 2. Video Surveillance System Software
 - a. Video Insight Monitor Plus
 - b. Contractor shall include additional software and licensing as required for the following add-on modules:
 - 1) Active Directory Integration
 - 2) Data Import
 - 3) Badge Design and Printing
 - 4) Flex API
 - 5) Browser based web interface
 - 6) Mobile Application
 - 7) Cloud Software

B. Video Surveillance System Hardware

- 1. Video Surveillance File Server
 - a. The existing Database Server shall be utilized
- 2. Video Surveillance Application Server(s)
 - a. Video Management Server
 - 1) Minimum Specifications
 - a) Minimum of i7 12th Generation
 - b) Minimum of 16GB RAM
 - c) Minimum of 16TB SSD
 - d) Shall have a minimum of Windows 10 IoT
 - 2) Shall Be Rack Mounted
 - 3) Acceptable Manufacturers:
 - a) iPRO
 - b) Or Approved Equal
- 3. Video Surveillance Client Workstation
 - a. Owner Furnished/Owner Installed

C. Video Surveillance Cameras

- 1. Accessories:
 - a. Provide all mounting accessories as necessary for device install location
- 2. Interior Cameras
 - a. Single Lens Fixed Dome IP Camera
 - 1) Shall be a minimum of 5 megapixels.
 - 2) Shall have a field-of-view greater than 100 degrees.
 - 3) Shall support H.265
 - 4) Shall have integral IR
 - 5) Shall have integral WDR
 - 6) Minimum of 3x optical zoom
 - 7) Shall be PoE powered.
 - 8) Approved Manufacturers:

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- a) iPRO
 - b) Or Approved Equal
 - b. Fish-Eye IP Camera
 - 1) Shall have a minimum resolution of 12 megapixels.
 - 2) Shall have integral IR
 - 3) Shall provide a 360-degree field of view.
 - 4) Shall be capable of H.265 compression.
 - 5) Shall be PoE powered.
 - 6) Shall provide integral de-warping
 - 7) Approved Manufacturers:
 - a) iPRO
 - b) Or Approved Equal
 - c. Multi-Lens Fixed Dome IP Camera
 - 1) Minimum of (4) Sensors
 - 2) Shall have a minimum resolution of 3 megapixels, per sensor.
 - 3) Shall provide a minimum of 180-degree field of view.
 - 4) Shall be capable of H.265 compression.
 - 5) Minimum IK08 Rating
 - 6) Shall have integrated IR
 - 7) Shall have integral WDR
 - 8) Shall be PoE powered.
 - 9) Approved Manufacturers:
 - a) iPRO
 - b) Or Approved Equal
3. Exterior Cameras
- a. Single Lens Fixed Dome IP Camera
 - 1) Shall be a minimum of 5 megapixels.
 - 2) Shall have a field-of-view greater than 125-degrees.
 - 3) Shall support H.265
 - 4) Shall have integral IR
 - 5) Shall have integral WDR
 - 6) Minimum IP66 & IK10 Rating
 - 7) Minimum of 3x optical zoom
 - 8) Shall be PoE powered.
 - 9) Approved Manufacturers:
 - a) iPRO
 - b) Or Approved Equal

D. Mounts and Accessories

- 1. Camera Mounts
 - a. Pendant Mount
 - 1) Shall include pole extension
 - 2) Shall be White
 - 3) Approved Manufacturers:
 - a) iPRO
 - b) Or Approved Equal
 - b. Recessed Mount
 - 1) Shall be plenum rated
 - 2) Shall be White
 - 3) Shall have protected cable entry
 - 4) Approved Manufacturers:
 - a) iPRO

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- b) Or Approved Equal
 - c. Wall Mount
 - 1) Shall support a minimum of 50lbs
 - 2) Shall be White
 - 3) Shall fit over standard single-gang junction box
 - 4) Approved Manufacturers:
 - a) iPRO
 - b) Or Approved Equal
 - d. Provide SDXC/micro SDXC cards as specified for edge storage
 - 1) Minimum UHS Speed Class of U3
 - 2) Minimum Video Speed Class of V60
 - 3) Approved Manufacturers:
 - a) Sandisk
 - b) Or Approved Equal
 - E. Labeling
 - 1. Permanent Labels for Copper Cables
 - 2. Panduit Self-Laminating Labels
 - 3. Or Approved Equal

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
 - 2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
 - 4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Building Industry Consulting Service International (BICSI)
 - 1. Telecommunications Distribution Methods Manual 13th Edition
 - 2. Outside Plant Design Reference Manual 5th Edition
 - 3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
 - 4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
 - 5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- E. Federal Communications Commission (FCC)
 - 1. FCC Part 15, Radiated Emissions Limits, revised 1998
 - 2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998

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3. FCC Part 76, Cable Television Service, revised 1998
- F. Insulated Cable Engineers Association (ICEA)
1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
 2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
 3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors
- G. International Electrotechnical Commission (IEC)
- H. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
 2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 3. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
 4. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms
- I. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
 2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
 4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
- J. National Cable Television Association (NCTA)
- K. National Electrical Contractors Association (NECA)
1. NECA-1 2015 Good Workmanship in Electrical Construction
- L. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
- M. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
 2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
 3. NFPA-101, Life Safety Code
 4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
 5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
- N. National Institute Standards and Technology (NIST)
- O. Occupational Safety and Health Administration (OSHA)

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- P. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
 2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
 3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
 4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
 5. ANSI/TIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
 6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
 7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
 8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
- Q. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
 2. RUS Bull 1751F-643 (2002) Underground Plant Design
 3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
 4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
 5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
 6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
 7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
 8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
- R. Underwriters Laboratories, Inc. (UL)
1. UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
 2. UL 910 (NFPA 262 1990) Applicable Flame Test

3.2 GENERAL REQUIREMENTS

- A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Consultant for direction before proceeding with that part of the work.
- B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.
- C. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

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- D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Consultant. The Contractor shall have written approval from the Consultant for any additional work beyond the Contract Documents prior to beginning such work.
 - E. Prior to execution, Contractor shall verify no changes in software, licensing or hardware versions have occurred since the bidding of the project. In the event of any changes, Contractor shall verify system compatibilities with their proposed design, and notify via RFI with the Consultant/Owner if the newest version(s) will require any upgrades / additional costs to the existing system(s).
 - F. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Consultant/Owner.
 - G. The Contractor shall obtain written permission from the Consultant/Owner before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, and/or ceilings.
 - H. If the Contractor does not obtain written approval from the Consultant/Owner prior to proceeding with the work, the contractor shall not be reimbursed for the work.
 - I. Contractor shall notify the Consultant/Owner a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Consultant/Owner to perform a walkthrough, review the scope of work, schedule, and escalation procedures.
 - J. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.
 - K. Contractor shall be responsible for the repair of any damage caused by the Contractor during the installation.
 - L. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.
 - M. Contractor shall maintain a set of working specifications, design drawings, schedules, and record drawings to be kept on site at all times and shall update the record drawings with any changes. Record drawings shall be made available for inspection at the request of the Consultant/Owner.
 - N. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.
 - O. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.
 - P. Contractor shall make all stored equipment and materials available for inspection at the request of the Consultant/Owner.

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- Q. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.
 - R. All devices shall be installed flush, plumb, and (where required) centered on the wall, ceiling tile or structure for which it is being installed, unless otherwise noted.
 - S. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.
 - T. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.
 - U. Contractor shall be responsible to properly protect any field installed devices from damage by other trades during construction.
 - V. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.
 - W. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:
 - 1. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e. servers, and other associated equipment.
 - 2. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

3.3 COORDINATION REQUIREMENTS

- A. Coordinate with the Division 26 contractor for the following:
 - 1. Power requirements, conduit sizes/pathways, sleeves, back boxes, grounding, and bonding requirements for the following:
 - a. Interior of the building
 - b. Exterior of the building
 - c. Pole, pedestals, canopies, awnings, building architectural surface, etc.
 - d. Special conditions (clean room, hazardous areas, roof top mounted devices, etc).
 - 2. Coordinate location and termination of earth ground for all device specified herein as required per manufacturer installation requirements.
- B. Coordinate with the Structured Cabling contractor for the following:
 - 1. Installation and power requirements of network infrastructure associated to the specified Video Surveillance System.
 - 2. Associated patch cable lengths and quantities required for the specified Video Surveillance System.
 - 3. Location, power, and backup requirements for rack mount equipment.
 - 4. Mounting and installation of injectors, midspans, extenders, surge protectors, etc.
- C. The Contractor is responsible for coordinating all VMS programming requirements with the Owner/Consultant.

- D. The Contractor shall coordinate with the Owner prior to installation for the following:
1. Network IP Addressing for Cameras, Servers, VMS Equipment
 2. Camera Views (Owner's Written Acceptance Required)
 3. Camera Labeling Scheme
 4. Firmware/software updates
 5. Client workstations requirements and locations
 6. Location of rack mount equipment.
 7. Locations, type, programming, configuration, and Owner's final expectations for Owner furnished Owner installed (OFOI) equipment and devices.
 8. Uninterruptible Power Supply (UPS) requirements.
 9. Programming including, but not limited to:
 - a. Camera Configuration
 - b. Recording Parameters
 - c. Edge Storage Configuration
 - d. Live View Parameters
 - e. Admin / User Settings
 - f. Date, Time, and Time Zone Configuration
 - g. Camera Analytic Detection and Event Triggering
 - h. VMS Software Configuration
 - i. Access Control Integration
 - j. User / Admin Groups
 - k. Camera Views

3.4 SYSTEM REQUIREMENTS

- A. Quantities are not provided; the contractor is responsible for furnishing materials as required to provide a complete and fully functioning video surveillance system. Quantities may be obtained from the drawings/schedule. In the event of a discrepancy between video surveillance specifications and the drawings, the greater quantity shall be furnished. The contractor shall also notify the Architect/Engineer/Design Consultant of any discrepancies immediately.
- B. Video Surveillance System Licensing
1. Contractor shall furnish and install camera licensing as required to furnish a fully operational video surveillance system.
 2. Contractor shall provide installation and configuration in accordance with the manufacturer's installation instructions.
 3. Provide additional licensing for additional camera system including but not limited to:
 - a. Access Control System Integration
- C. Surveillance Cameras
1. All cameras are to be purchased near the time of installation.
 2. Interior Camera
 - a. Single Lens Fixed Dome IP Camera
 - 1) The contractor shall furnish and install the cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
 - 2) The contractor shall provide installation in accordance with the manufacturer's installation instructions.
 - 3) The contractor shall coordinate exact camera location prior to installation.
 - 4) The contractor shall power and commission equipment in accordance with the manufacturer's instructions and guidelines.

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- 5) The contractor shall program all network address information for the camera and ensure the camera can communicate with the video management system server.
 - 6) The contractor shall provide all necessary manufacturer mounting accessories to meet the requirements of the installation.
 - b. Fish-Eye IP Camera
 - 1) The contractor shall furnish and install the cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
 - 2) The contractor shall provide installation in accordance with the manufacturer's installation instructions.
 - 3) The contractor shall coordinate exact camera location prior to installation.
 - 4) The contractor shall power and commission equipment in accordance with the manufacturer's instructions and guidelines.
 - 5) The contractor shall program all network address information for the camera and ensure the camera can communicate with the video management system server.
 - 6) Configure De-warping/Quad PTZ viewpoints as required.
 - 7) The contractor shall provide all necessary manufacturer mounting accessories to meet the requirements of the installation.
 - c. Multi-Lens Fixed Dome IP Camera
 - 1) The contractor shall furnish and install the cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
 - 2) The contractor shall provide installation in accordance with the manufacturer's installation instructions.
 - 3) The contractor shall coordinate exact camera location prior to installation.
 - 4) The contractor shall power and commission equipment in accordance with the manufacturer's instructions and guidelines.
 - 5) The contractor shall program all network address information for the camera and ensure the camera can communicate with the video management system server.
 - 6) The contractor shall provide all necessary manufacturer mounting accessories to meet the requirements of the installation.
 - 7) Camera shall be configured in 270° field of view, with one sensor pointed below camera as indicated in drawings.
 3. Exterior Camera
 - a. Single Lens Fixed Dome IP Camera
 - 1) The contractor shall furnish and install the cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
 - 2) The contractor shall provide installation in accordance with the manufacturer's installation instructions.
 - 3) Provide weather covers as specified.
 - 4) The contractor shall coordinate exact camera location prior to installation.
 - 5) The contractor shall power and commission equipment in accordance with the manufacturer's instructions and guidelines.
 - 6) The contractor shall program all network address information for the camera and ensure the camera can communicate with the video management system server.
 - 7) All corner mounted cameras shall have connection from camera to junction box, via ½" liquid-tight non-metallic flexible conduit.
 - 8) The contractor shall provide all necessary manufacturer mounting accessories to meet the requirements of the installation.
 - b. Multi-Lens Fixed Dome IP Camera

- 1) The contractor shall furnish and install the cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
- 2) The contractor shall provide installation in accordance with the manufacturer's installation instructions.
- 3) Provide weather covers as specified.
- 4) The contractor shall coordinate exact camera location prior to installation.
- 5) The contractor shall power and commission equipment in accordance with the manufacturer's instructions and guidelines.
- 6) Camera shall be configured in 270° field of view, with one sensor pointed below camera as indicated in drawings.
- 7) The contractor shall program all network address information for the camera and ensure the camera can communicate with the video management system server.
- 8) All corner mounted cameras shall have connection from camera to junction box, via 1/2" liquid-tight non-metallic flexible conduit.
- 9) The contractor shall provide all necessary manufacturer mounting accessories to meet the requirements of the installation.

D. Exterior ESS Camera Surge Protection

1. Surge Suppression devices shall be provided and installed by Division 27 unless otherwise noted.
2. Camera side surge protection devices if required shall be mounted in ladder accessible ceiling space. Contractor shall clearly mark location on as built drawings.

E. Pathway Cable Support

1. Communication room equipment racks/cabinets and structured cable system are to be provided by others and this section is for information only.
2. All cables shall be installed and supported in conduit systems, cable trays, cores, sleeves, etc. as indicated in the technology drawings.
3. When cables leave the main pathway systems as indicated on the security drawings, they shall be installed and supported in Contractor furnished and installed j-hooks or saddle straps.
4. No cable pathway shall exceed 40% fill ratio.
5. The contractor shall furnish a separate j-hook or saddle strap pathway for each wire type.
6. J-hooks and saddle straps shall be installed no more than five-feet (5) apart on center, using only manufacturer-approved installation methods and hardware.
7. J-hooks shall be furnished with closure clips.
8. Maximum sag between supports shall not exceed twelve inches (12).
9. Contractor shall establish j-hook and saddle strap pathways and shall coordinate pathways with all other disciplines. Under no-circumstances shall these pathways be used to support other low-voltage applications not included in this specification.

F. Grounding and Bonding

1. General
 - a. The Contractor shall ensure metal-to-metal contact for all terminations.
 - b. All materials shall be UL Listed, no exceptions.
 - c. All connections shall be made with UL Listed compression 2-hole lugs.
 - d. The contractor shall use an anti-oxidation compound on all connections.

- e. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.
- f. A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-B (Interconnects multiple TBBs on the top floor and every 3rd floor in between).
- g. The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.

G. System Labeling

1. The contractor shall verify room numbers and confirm the final room numbering scheme with the Consultant prior to generating any labels.
2. Cables shall be labeled within (6) inches from the termination point inside the Equipment Room/Telecommunications Rooms.
3. Cables shall be labeled within (6) inches from the termination point at the device end.
4. Cables shall be labeled identically at both ends.
5. Equipment
 - a. Video Surveillance System Devices
 - 1) Equipment to be labeled shall include but is not limited to cameras, patch panels, patch cords. Coordinate name, font style, and devices to be labeled with Owner or Owner's representative before labeling. The contractor shall also identify where the label shall be placed. his coordination shall take place before substantial completion. The contractor is to provide computer generated labels. Handwritten labels are not allowed and will not be accepted.

3.5 TESTING REQUIREMENTS

A. System Start-Up

1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Consultant shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

B. Substantial Completion

1. To qualify for the Consultant's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
 - a. Installation of all devices must be completed.
 - b. All sub-system interfaces must be complete and operational.
2. Substantial Completion shall not be construed as final acceptance of the Work.

C. System Acceptance

1. Final acceptance testing of the Work will be conducted by the Consultant/Owner.
2. Before system acceptance testing, Security Contractor shall conduct a complete in-house QA/QC test of the entire Video Surveillance System and provide a written report on the results of that test.
3. Prior to any final acceptance testing, the Contractor shall submit two sets of preliminary (draft) Record Drawings to the Consultant. The preliminary Record Drawings are to be used by the Consultant to conduct the system final test.

4. Conduct a complete test of the entire Video Surveillance System and provide the Consultant with a written report on the results of that test. During the course of this test, place the integrated Video Surveillance System in service, and calibrate and test all equipment.
5. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Video Surveillance System by placing it in near real operating conditions. During this period the Video Surveillance System shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
6. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Consultant that the installed complete Video Surveillance System has been calibrated, tested, and is fully functional as specified herein.
7. Prior to the final acceptance test, coordinate with the Consultant for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.
8. Upon written notification from the Contractor that the Video Surveillance System is completely installed, integrated and operational, and the burn-in testing completed, the Consultant will conduct a final acceptance test of the entire system.
9. During the final acceptance test by the Consultant, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Video Surveillance System to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Video Surveillance System head-end equipment will be evaluated.
10. The functionality of the various interfaces between systems will be tested.
11. Following the Video Surveillance System head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
12. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. All video surveillance cameras shall be pointed and aimed in the views as shown in the drawings and using best practices. Contractor shall provide a minimum two employees to verify all cameras have been pointed and aimed to achieve Owner final approval. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Consultant or Owner, at no charge to the Consultant or Owner.
13. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Consultant will issue a letter of final acceptance.

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14. The Consultant retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/ Consultant's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Consultant with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs or modifications to the system will be conducted without the permission of the Consultant.

3.6 TRAINING REQUIREMENTS

- A. Provide for (4) hours of training for five (5) persons on each system.
- B. Provide a test report showing the system has been 100% tested and 100% operational prior to training/demonstration.
- C. Coordinate with the Owner to establish a training outline and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.
- D. Contractor training shall be conducted onsite with a manufacturer's representative in attendance.
- E. Operator training shall include, but not be limited to the following:
1. All operating procedures
 2. System configuration
 3. Camera Configuration
 4. Rules Configuration
 5. Alarm acknowledgement, alarm response logging, and map graphics functionality
 6. Manipulation of cameras and presets.
 7. Archiving Recorded Video
- F. Record, label, and catalog all training on USB Flash Drive and "user's manual" written specifically for personnel onsite, for daily routine operations of the systems. Provide the USB Flash Drive and user's manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.
- G. The Contractor shall be on call during the Warranty to answer any questions the Owner might have. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested by the Owner until the total number of training hours has been completed.

3.7 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

- A. As-Built Drawings
1. Drawings shall be provided to the Owner/Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Owner/Consultant.

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2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Owner/Consultant electronically.
 3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
 4. Drawings shall be provided in the original size as issued by the Consultant.
 5. Drawings shall retain the formatting and title block of the original drawings as issued by the Consultant.
 6. Provide a conformed set of Drawings as related to the project, depicting the condition of the Video Surveillance System as installed to include but not limited to:
 - a. ASI, PR and Addendum items installed throughout the duration of the project.
 7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Video Surveillance System enclosure. Coordinate with Owner for final storage location.
 8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
 - a. Video Surveillance System IP Address
 - b. Locations of Midspans, PoE Injectors and Surge Protectors installed
 - c. Video Surveillance System labeling scheme.
- B. Operation & Maintenance Manuals
1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
 2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive)
- C. Manufacturer's Product Warranty
1. Certificate of product warranty shall be provided to the Owner/Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Consultant.
 2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
 3. One original and two copies of the Manufacturer's product warranty shall be provided.
 4. Proof of purchase of all video surveillance cameras indicating warranty start and end period shall be provided.
- D. Contactor's Statement of Warranty
1. Statement of warranty shall be provided to the Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Consultant.
 2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
 3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 20 00

SECTION 28 31 03
ADDRESSABLE DEVICE FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.02 DESCRIPTION OF WORK:

- A. General: The extent of fire alarm system work is as shown and scheduled and includes, but is not limited to, providing a system with the following functions and operations:
1. Provide a complete distributed microprocessor based, 24 volt dc, closed circuit, electrically supervised, addressable device multiplexed fire alarm and communication system to be wired, tested, and left in first class operating condition. The system shall include, but not be limited to, a control panel with reserve standby power, voice communications system, annunciators, manual alarm stations, ceiling smoke sensors, duct smoke sensors, heat sensors, addressable input and output devices, sprinkler waterflow switches, valve supervisory switches, audible and visual alarm indicating devices, raceways, wiring and all hardware and software as required to effect an operational system as herein specified. Each alarm device shall be individually addressable.
 2. The system shall operate as a non-coded, continuous sounding system which will sound alarm devices until manually silenced, as herein specified.
 3. The system shall be wired as a Class B and style 4 supervised system for all circuits.

1.03 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the latest edition of the following standards:
1. National Fire Protection Association Standards:
 - a. NFPA 70 National Electrical Code.
 - b. NFPA 72 National Fire Alarm and Signaling Code.
 - c. NFPA 72E Automatic Fire Detectors.
 - d. NFPA 72G Installation, Maintenance and Use of Notification Appliances for Protective Signaling Systems.
 - e. NFPA 72H Testing Procedures for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems.
 - f. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
 - g. NFPA 101 Life Safety Code.
 - h. NFPA 13 Sprinkler Systems.
 2. Underwriters' Laboratories, Inc. Requirements and Listing for use in Fire Protective Signaling Systems as follows:
 - a. UL 864 Control Units and Accessories.
 - b. UL 268 Smoke Detectors - Systems.
 - c. UL 268A Duct Smoke Detectors.
 - d. UL 217 Smoke Alarms.
 - e. UL 521 Heat Detectors.
 - f. UL 228 Door Holders - Closers.
 - g. UL 464 Audible Signaling Devices.
 - h. UL 1638 Visual Signaling Devices.
 - i. UL 38 Manual Signaling Boxes.
 - j. UL UOJZ.
 3. International Building Code latest edition and the requirements of state and local authorities having jurisdiction.
 4. Comply with requirements of the Americans with Disabilities Act of 1990.

1.04 QUALITY ASSURANCE:

- A. Manufacturers: The equipment specified herein is that of the Notifier Company, and constitutes the style of operation, quality of construction, features and physical size limitations required for this project. Equipment by Simplex or Johnson Controls will be considered as equal if demonstrated to comply with the requirements of this Specification.
- B. UL and FM-listing: All fire alarm system components shall be UL and FM listed for fire alarm use. The UL listing shall be under category UOJZ to assure that the entire system has been tested as an integral life safety system.
- C. All equipment furnished shall be the current standard products of a single manufacturer and shall bear the label of the Underwriters' Laboratories for use in fire alarm system designed in compliance with the requirements of NFPA codes. Raceways, wiring and terminations shall be accomplished in compliance with the requirements of the National Electric Code, Article 760.
- D. The system as installed shall, upon completion, be certified by a state licensed fire alarm installation superintendent to the Owner as being installed in compliance with the specification, the requirements of all state and local codes, and as being operational and free from defects.
- E. All system equipment supplied shall be listed by the Underwriters' Laboratories for NFPA 72 system use, and all applicable NFPA Codes.
- F. The installing contractor shall be authorized and designated representative of the fire alarm system manufacturer to sell, install and service the manufacturer's equipment and shall stock the required spare parts to keep the system in operation. The installing contractor shall maintain a staff of specialists for technical assistance and system maintenance.
- G. The installing contractor must be licensed by the State Fire Marshal to sell, install, and service fire alarm system as required by Article 5.43-2 of the Texas Insurance Code.
- H. The installing contractor shall have on his staff a minimum of five installation superintendents who are licensed by the State Fire Marshal's office for such purpose and under whose supervision installation, final connections and check out will take place, as required by the Texas Insurance Code.
- I. The installing contractor or equipment supplier shall have a staff a minimum of one certified NICET Level II state licensed fire alarm planner under whose supervision system design shall take place.
- J. The equipment supplier shall provide 24 hour, 365 days per year emergency service with qualified and state-licensed service technicians.
- K. The installing contractor shall have been actively engaged in the business of selling, installing, and servicing microprocessor and multiplex fire alarm systems for at least 8 years and shall have proof of experience in the installation and maintenance of the type of fire alarm system specified herein.
- L. The manufacturer or his representative shall maintain within [50 miles] of the installation, a staff of factory trained, state licensed fire technicians, together with all support parts necessary for maintenance of the system.
- M. Where approved in writing by the system manufacturer and installing contractor, the Electrical Contractor may install all conduit and boxes. The system wiring shall be pulled in by the installing contractor. All system connections, device installation, system start-up and testing shall be performed by the installing contractor. Rough-in by the electrical contractor shall not in any way affect the system manufacturer's and installing contractor's full responsibility for the installed fire alarm system.
- N. The manufacturer shall submit legal documentation indicating that the purchased fire alarm equipment will be provided with parts, and support for 10 years after the acceptance by the Owner.
- O. All wiring shall be listed for limited energy fire alarm use and rated for 300 volts minimum.

- P. The complete combination fire alarm system shall comply with the Harris County Building and Fire codes. Modifications required to provide compliance shall be made at no cost to the Owner. Where Contract Document requirements are in excess of Code requirements are permitted under the Code, the Contract Documents shall govern.

1.05 SUBMITTALS:

- A. Shop Drawings submittals shall include, but not be limited to, the following:
1. A written description of the system operation (written in this specification format), with all exception and/or deviations clearly highlighted or identified.
 2. A block diagram showing system components, wire runs, wire counts and wire sizes.
 3. A control panel layout diagram showing the location of all modules and wiring and interconnection schematics.
 4. Calculations justifying battery size, power supply size, amplifier size, and wiring sizes based on worst case occurrence.
 5. Manufacturer's descriptive literature for all panels, modules and peripheral equipment describing size, color, finish, capacity and electrical characteristics.
 6. A complete listing of all associated software showing the relationship of alarm points, control outputs, control inputs and indicators.
 7. An alarm matrix showing alarm and control function for an alarm in each device/zone.
 8. Scaled floor plan drawings locating and naming each device/zone and showing wiring and conduit sizes from each device back to the transponders.
 9. A complete riser/wiring diagram showing zoning and addressing and wiring and conduit sizes from the CPU to all remote terminal units, graphics terminals, flat panel displays, printers, and other system devices.
 10. Completely identified and marked catalog cuts of all associated equipment and devices, with all non-applicable items crossed out, or applicable devices clearly highlighted and/or identified.
 11. Complete and detailed point-to-point wiring diagrams for all devices in the system.
 12. Complete Bill of Material for all equipment.
 13. A printout showing the proposed custom software messages for each device/zone and for each control function.
 14. A copy of the form to be used for final tests, 100% audit and checkout shall be submitted for approval.
 15. Additional information as required in Section 26 00 01, "Electrical General Provisions".

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver fire alarm system components in factory-fabricated containers.
- B. Store in a clean, dry space and protect from the weather.
- C. Handle control and annunciator panels carefully to avoid damage to material components, enclosure and finish.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS:

- A. General: Provide the required fire alarm system products in the sizes and capacities required or indicated, complying with the manufacturer's published product information of standard materials and components, designed and constructed for the applications indicated.

2.02 SYSTEM OPERATION:

- A. Activation of an "intelligent" smoke detector shall cause the following operations and indications (refer to other paragraphs in this section for additional operations and indications):
1. When an "intelligent" smoke detector senses an abnormal level of smoke, the loop interface module shall automatically initiate a "check" mode. Four consecutive samples shall be made of the prospective detector. Upon completion of four consecutive smoke trouble conditions, the detector is considered "checked" and the system goes directly into an alarm mode, unless the verification mode is activated for the detector.
 2. Alarm verification shall be programmable by detector(s) to initiate a verification sequence after the "check" procedure and the Fire Alarm Control Panel shall wait a field-programmable delay period (0 to 50 seconds), and then proceed to resample the detector four more times for continued presence of smoke. If three or more samples verify an alarm condition still exists, the system will then initiate all alarm sequences specified herein. Less than three consecutive samples during the verification cycle will NOT result in a system alarm condition. The system shall incorporate the ability to log in memory the number of verification events that have occurred for each selected device.
 3. The system common alarm LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.
 4. An alpha-numeric LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time of alarm. Location and zoning messages shall be custom field-programmed to respective premises.
 5. Appropriate status change message(s) shall be transmitted to all annunciators, graphics terminals, CRT displays and printers and an alarm shall be transmitted to a remote Central Station.
 6. Activate all audible alarm zones on the floor of alarm, the floor above and the floor below with a prerecorded alarm message.
 7. Flash all visual alarm signal zones on the floor of alarm, the floor above and the floor below.
 8. Activate addressable output relays to unlock all locked security doors.
 9. Activate addressable output relays to unlock electric door strikes at the Fire Command Center.
- B. Activation of any addressable manual pull station, sprinkler waterflow switch or "intelligent" heat detector shall cause the following operations and indications (refer to other paragraphs in this section for additional operations and indications):
1. Cause all operations and indications described in Paragraph 2.03/A.3 through 2.03/A.9 to occur.
- C. Air handling units shall be shutdown via addressable output relay whenever the unit duct smoke detector is activated or the building smoke exhaust system on the floor served by the unit is activated.
- D. Closure of a supervised OS&Y or PIV valve sensed via a supervisory switch or loss of supervisory air pressure in a dry-pipe sprinkler system, sensed via a pressure switch shall cause the following operations and indications:
1. The system common alarm LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.
 2. An alpha-numeric LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location, and time of alarm. Location and zoning messages shall be custom field-programmed to respective premises.
 3. Appropriate status change message(s) shall be transmitted to all graphics terminals, CRT displays, and printers.
 4. Appropriate status change message(s) shall be transmitted to all [annunciators,] graphics terminals, CRT displays, and printers.

- E. The presence of a ground condition or an open circuit on any alarm initiation circuit or a ground condition, open circuit or short circuit on any alarm indicating circuit, blockage, lens contamination or physical misalignment of any beam type smoke detector, a trouble condition at a fire suppression system panel or other trouble condition shall cause the following actions and indications:
 - 1. The system common trouble LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the trouble condition shall silence the audible trouble device and revert the flashing common trouble LED to a steady state.
 - 2. An alpha-numeric LCD Display shall indicate all applicable information associated with the trouble condition and its location. System trouble diagnostics shall assist in defining the trouble condition. Unacknowledged alarms/messages shall have priority over any trouble displays and take precedence on the LCD annunciator. Trouble conditions will be stored in memory for future recall/ display.
 - 3. Appropriate status change message(s) shall be transmitted to all [annunciators,] graphics terminals, CRT displays, and printers.
- F. All designated "nonsilenceable" auxiliary control functions shall remain in operation (even upon silencing of audible alarms) until such time as the control panel is cleared and reset manually (i.e. fan control outputs, central station interface, elevator recall interface, etc.).
- G. Provisions shall be included within the Fire Alarm Control Panel for the following manual controls in addition to those previously mentioned:
 - 1. Disconnect audible signalling while testing.
 - 2. Temporary software bypass of selected alarm points.
 - 3. Software assignment of selected alarm points to alarm verification function as a method of tracking alarms caused by environmental factors or maintenance requirements. Waterflow switches, smoke detectors, and valve supervisory switches shall be assigned to the verification group to eliminate nuisance alarms.
 - 4. Any zone may be enabled or disabled remotely via a command using an RS232C Port or other suitable means.

2.03 SYSTEM DEVICES:

- A. System devices shall be located as shown on the Drawings. The Contractor shall refer to all the drawings to determine where devices are to be located. All system devices shall be numbered with a unique number. The numbering system shall include the building area, type of device, and device number. This numbering system shall be shown on each submitted floor plan drawing, fire alarm riser diagram and be tabulated. The tabulation shall be included in each O&M Manual submitted to the Owner.

2.04 SYSTEM ZONING:

- A. The system shall employ "intelligent" heat and smoke detectors and addressable interface devices capable of being recognized and annunciated at the main control panel and CRT terminals on an individual basis. All devices shall be field-programmed into software zones for the purpose of general area identification and annunciation. However, each device shall also be annunciate identified on an individual basis including exact location and device type. All zoning/device location information shall be totally field-programmable to exact job requirements. Devices shall be zoned as follows:
 - 1. Manual pull stations, area smoke and heat detectors and sprinkler water flow and pressure switches shall be zoned by floor and smoke compartment.
 - 2. Elevator lobby, machine room and shaft smoke detectors shall be zoned by elevator group.
 - 3. HVAC equipment supply air and return air smoke detectors shall be zoned by floor and smoke compartment.
 - 4. Fire suppression system(s), kitchen hood fire suppression system, fire pump monitoring and similar functions shall each be zoned separately.

- B. Initiating and monitored devices shall include, but not be limited to, the following:
 - 1. Manual pull stations.
 - 2. Ceiling smoke detectors.
 - 3. Duct smoke detectors.
 - 4. Ceiling heat detectors.
 - 5. Addressable input devices.
 - 6. Sprinkler flow and pressure switches.
 - 7. Valve supervisory switches.
- C. The system shall utilize remote transponder panels for distributed voice communications, firefighters' telephone conventional zoned initiating circuits and auxiliary control output circuits. Remote transponder panels shall communicate with the main CPU via the SLC data loop and be capable of being intermixed on the same loop as intelligent heat and smoke detection and control modules.
- D. Output devices shall include, but not be limited to, the following:
 - 1. Ceiling alarm speakers.
 - 2. Wall and ceiling alarm speakers/visual signals.
 - 3. Visual alarm devices.
 - 4. Addressable interface relays.
 - 5. Magnetic door holders.

2.05 SYSTEM CONFIGURATION:

- A. System equipment shall include, but not be limited to an operator's control/system control panel, remote transponder panels, high resolution VGA color monitor(s), graphic and system printers, voice paging panel, firefighter's telephone, firefighter's HVAC override, battery back up, alarm indicating devices, door hold opens and output relays and other devices required to provide a complete and working system.
- B. The system control unit shall be connected to remote transponder panels on a looped signaling line circuit. The wiring of the loop shall be so arranged that additional transponder panels may be inserted in the loop without requiring additional wires to be installed between transponder panel and the system control unit. In addition, loops shall be so arranged that any wiring fault on a loop shall not disable more than 250 initiating devices. A single open ground or multiple opens in different wires at the same location shall not prevent receipt of alarm signals from that loop.
- C. The system shall be of the active multiplex/addressable type wherein each initiating device shall be repetitively scanned, causing a signal to be transmitted to the control unit that indicates the individual initiating device circuit installation wires are intact. Loss of such a signal at the system control unit shall result in a trouble indication as specified hereinafter for the particular indicating device affected. All indicating devices in the system shall transmit their normal, trouble or actuated status signals in no less than 5 second intervals.
- D. Each individual smoke detector shall be of the analog type so that the system can be used to read smoke levels on a real time basis from selected smoke detectors for maintenance and diagnostic purposes. All smoke detectors and other initiating devices shall be individually indicated at the main control panel, the color graphics unit and each DGP, when changing to an alarm or trouble state.

2.06 FIRE ALARM SYSTEM CENTRAL EQUIPMENT:

- A. General: The Fire Alarm Control Panel shall be Notifier Series **VAM2020** or approved equal. The control panel shall be modular in design utilizing distributed solid state microprocessors and be capable of future expansion. The microprocessor-based CPU shall be completely field-programmable. CPU module shall provide for programmable nonvolatile RAM memory utilizing integral lithium-based memory IC chips. Each panel module shall be independent employing its own microprocessor circuitry for reliability and independent operation in case of main CPU failure. The system control unit shall have capacity for the required active detection and output

points with space for future use and expansion. The control unit shall be listed to the latest UL 864 Standard. All circuitry shall be UL listed for power-limited application and use positive temperature coefficient devices for current limiting. The panel shall be provided with keylock hinged door to access system controls/switches. The panel door shall be provided with a transparent window for viewing all alarm, trouble indicators, and LCD annunciator. The control unit shall be designed for flush-mounting.

- B. Central Processing Unit Module (CPU): The CPU shall communicate with monitor and control all other modules in the panel via internal serial communications techniques.
1. Removal, disconnection, or failure of any control panel module shall be detected and reported by the CPU.
 2. The CPU shall contain and execute all custom control-by-event programs for specified events if a fire situation is detected in the system. Such programs shall be held in nonvolatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
 3. The CPU module shall contain a real-time clock circuit to time/date stamp system events and execute custom time control programs. Time control program events shall be terminated in a fire conditions.
- C. Display Interface Board (DIA): The DIA shall provide all touchpad controls and indicators used by the system operator and may also be used to program all control panel and system parameters.
1. The DIA shall contain, and display, custom alphanumeric labels for all intelligent detectors and addressable modules. Such label information shall be stored in field-programmable nonvolatile memory.
 2. The DIA shall provide an 80 character alphanumeric Liquid Crystal Display (LCD).
 3. The DIA shall provide five Light-Emitting Diodes (LEDs) for ac power, system alarm, system trouble, display trouble, and disable.
 4. The DIA shall provide a 25 key membrane keypad with control capability to command all system functions, status readouts, manual control action, and entry of any alphabetic or numeric information. The keypad shall include means to enter two different five digit passwords to prevent unauthorized manual control or programming.
- D. Serial Interface Board (SIB): The SIB shall provide the following interfaces:
1. Two ports for remote printer/CRT devices (RS-232c).
 2. Two ports for future local printer (RS-232c).
 3. One port for remote LED annunciators (RS-485).
 4. One port for local LED annunciators (SCB).
- E. Loop Interface Board (LIB): LIB's shall be provided to monitor and control each loop of intelligent detectors and addressable modules.
1. The LIB shall contain its own independent microprocessor control and shall be capable of alarm detection and automatic control action on its own loop even if a failure occurs in the system central processor unit, internal connections, or other modules.
 2. The LIB shall communicate and provide power to all devices on its Style 4 loop over a single pair of wires. For dynamic Style 4 supervision the loop may be branch-circuited or "t-tap" connections may be made off of the loop. Loop wiring shall be twisted shielded pair of up to 10,000' in length.
 3. The LIB shall receive digital/analog information from all "intelligent" detectors and shall process this information to determine normal, alarm, trouble and sensitivity conditions. The analog information shall also be used for automatic test and determination of maintenance requirements.
 4. The LIB module shall individually monitor all "intelligent" detectors for sensitivity variation initiating a trouble condition should detector sensitivity "drift" toward either threshold of false alarming or nonalarming conditions. In addition, the system shall have the capability to read each detector's sensitivity, and if need be, electronically adjust the detector sensitivity as required for existing conditions within UL-recommended limits.

5. The LIB shall communicate continuously with each "intelligent" detector, remote transponder and addressable module on its loop and verify its proper function and individual status. Communication with up to 198 such devices per loop shall be performed every 6 seconds or less.
- F. Network Interface Board (NIB): NIB's shall be provided to allow the voice communications system to direct communications through this fire alarm system and the future [] fire alarm system.
- G. Control Switches: Provide the following control switches at the Fire Alarm Control Panel.
 1. Acknowledge switch.
 2. Signal silence switch.
 3. System reset switch.
 4. System test switch.
 5. Lamp test.
- H. Nonlock Walk Test: The system shall include a special nonlock "walk test" mode where each initiating device is manually placed in alarm. The control panel pulses the system audible devices on detection of each such alarm and automatically resets the panel, permitting a single serviceman to functionally test the entire system.
- I. Automatic Detector Test: The system shall include a special automatic detector test features which permits reading and adjustment of the sensitivity of all intelligent detectors from the main control panel. In addition, the automatic test feature shall also permit the functional testing of any "intelligent" detector or addressable interface device individually or by zone from the main control panel. Results of the test are then indicated on the LCD display. A printout of all test data shall be capable via the system printer.
- J. Special System Reports: The system shall have the ability to generate and print, upon command, system and point status reports.
 1. Selection of "system" read status provides the operator with global system programming information including: alarm verification, SLC loop styles, number of SLC loops, number of software zones, number of auxiliary power supplies, signal silence inhibit.
 2. Selection of "point" read status provides the operator with selected individual point programming data including: point status (normal, alarm, trouble, disabled, etc.), address, type I.D., control by event, custom alphanumeric label, verification status, alarm threshold level, sensitivity, silenceable/ nonsilenceable, SLC loop number, and device number.
- K. System Diagnostics: The system shall include special software to detect, diagnose, and report failures and isolate such failures to a printed circuit board level.
 1. Each module via its resident, independent processor shall periodically perform independent self-test routines as a self-operational/performance test. Any irregularities are reported via the LCD display and trouble indicators.
 2. A lamp test function shall be provided to test all system indicators including the LCD display. This function shall also test the panel trouble device for proper operation.
 3. A keypad test function shall also be provided allowing the user to interactively confirm that all keys are functional and operating correctly.
 4. The system shall include independent "Watch-Dog" timer software to detect and report failure of any microprocessor circuit, memory, or software. The function of this safe-guard software/circuitry is to then restart the respective processor and maintain proper operation of the system. In addition, the master CPU has control over a hardwired reset terminal which can perform a system-wide restart.
- L. Field Programming: The system shall be 100% field-programmable without the need for external computers, or PROM programmers, and shall not require replacement of memory ICs. Systems requiring factory-programming/reprogramming or replacement of memory IC chips shall NOT be acceptable.
 1. All programming may be accomplished through the front control panel indicators and switches or via a CRT display unit.

2. All programs shall be stored in nonvolatile RAM memory.
 3. Programming shall be accomplished only after entering an appropriate and preselected five digit password security code.
 4. All programming functions shall be initiated via special system "prompting" menus via the system main CPU. The system shall be capable of direct English language programming and prompting and not require complex digital equations or special formulations.
 5. The system shall provide a means to "review" all programmed functions.
 6. The system shall be capable of revising/changing programmed functions or system expansion at anytime subsequent to initialization as described herein without factory-modifications or factory-reprogramming.
 7. Any addressable indicating circuit or auxiliary addressable relay shall be programmed to activate on alarm of a single initiating device or a combination of initiating devices.
- M. Event History: The main fire alarm panel shall have the resident ability to store a minimum of 400 system events in chronological order of occurrence.
1. Event history shall include all system alarms, troubles, operator actions (i.e. acknowledge, silence, reset, program entry, etc.), unverified alarms, circuit/point alterations, component failures.
 2. Events shall be time and date stamped and be capable of being recorded and/or reviewed without purging the history file.
 3. Events shall be stored in non-volatile buffer memory. Access to history buffer shall be secured via five digit password security code.
 4. Event recording shall automatically overwrite the oldest event(s) in memory beyond the initial 400 events.
 5. Systems not employing event history memory storage shall be required to furnish a printer/recorder for recording system events.
- N. Power Supply: The power supply for the panel and all fire alarm peripherals shall be integral to the control panel.
1. The power supply shall provide all control panel and peripheral power needs with filtered power as well as 3 amperes of regulated 24 volt dc power for external audio/visual devices. The audio/ visual power may be increased as needed by adding additional modular expansion power supplies.
 2. All power supplies shall be designed to meet UL and NFPA requirements for power-limited operation on all external signaling lines, including initiating circuits and indicating circuits.
 3. All circuitry shall be UL listed for power-limited application and use positive temperature coefficient devices for current limiting. Fuses or other thermal overload type protection shall be unacceptable.
 4. The system shall derive its primary operating power from a 120 volt ac, single phase, 60 Hz supply. There shall also be a 24 volt battery standby power source with internally supervised batteries and automatic charger, capable of operating the entire system for a minimum of 8 hours in the supervisory mode and then be capable of operating the alarm devices for a minimum of 20 minutes.
 5. The power supply unit shall contain suitable overvoltage protection to prevent any malfunction or damage which might occur from line power surges (lightning).
 6. Upon loss of main power, the power supply unit shall automatically revert to battery power and the system shall remain fully operational.
 7. When the ac power is restored, the control unit shall automatically revert to normal operation without requiring any manual restarting procedures.
 8. The battery shall be automatically charged by a built-in short-circuit-proof charger.
 9. The charging current shall be automatically controlled according to the battery's ambient temperature.
 10. After a full discharge, the system shall be able to recharge the batteries completely within 12 hours.

11. The connection to the battery shall be automatically switched off when the voltage drops below 19 volts to protect battery cells from damage to deep discharge.
12. Sealed lead acid batteries shall be used for emergency power source.
13. The entire power supply charger circuits including fuses shall be supervised both positive and negative ground fault supervision, battery/charger fail condition, ac power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required. Any malfunction, or blown or missing fuses shall result in a fault indication on the control unit.

2.07 REMOTE TRANSPONDER PANELS:

- A. Remote transponder/control panels shall be distributed remotely throughout the facility as required and as indicated on the Drawings. Transponders shall provide input/output interface between all field devices/equipment and main system CPU.
- B. All functions of the transponder unit(s) shall be field-programmable via the main system CPU and incorporate nonvolatile RAM memory. Each unit shall be capable of operating independently in default mode should communication with the main CPU be disrupted. Transponders shall be capable of operating on the system SLC intelligent loop in conjunction with intelligent field devices.
- C. The transponder shall include a resident microprocessor based CPU control module interfacing the main system CPU with respective I/O modules served by the resident/local CPU. The local CPU shall provide each transponder with common status indicators, pilot/status LED, common alarm LED, and common trouble LED. Each CPU module shall include local silence, reset, trouble display, lamp test, and reset capability. Each control module shall provide dual Form C common alarm and trouble contacts as well as a local alarm/trouble Piezo sounder.
- D. Each transponder shall be capable of providing audio power supervision/annunciation, power supply supervision/annunciation, and supervision of all associated I/O modules. Each transponder shall be field programmable for alarm verification. Selection of alarm verification shall provide each associated zone/ input module with the automatic ability to verify all smoke detector initiated alarm signals before initiating any event initiated output functions. The system shall have the ability to electronically differentiate between smoke detector alarms and contact/shorting device alarms and will NOT allow the verification sequence to occur from signals initiated from pull stations, flow switches, heat sensors, etc.
- E. All transponder mapping/addressing shall be accomplished via the transponder CPU module.
- F. Transponders shall be provided with zone initiation input modules as required. Each module shall provide eight Style B or four Style D initiating zone circuits. Each zone shall be capable of intermixing two-wire smoke detectors and contact type devices on the same circuit. Each zone shall assume a designated and distinct address I.D. within the system. The transponder shall monitor the status of each zone module and zone circuit for normal, alarm and trouble, and report any status or change thereof to the main system control panel/CPU. Each zone shall be equipped with status and trouble LED indication. Each zone shall be field programmable for alarm, waterflow, supervisory, or non-alarm/status configuration. Each zone shall be capable of being programmed/mapped in software to activate selected output functions.
- G. Transponders shall be provided with zone alarm output modules as required. Each module shall provide eight Style Y or four Style Z indicating appliance circuits. Each indicating circuit shall be capable of being field programmed as conventional alarm, audio, and/or telephone circuits. Output circuits shall be power limited. Each output zone shall assume a designated and distinct address I.D. within the system and be field programmable for control by event actuation. The transponder shall monitor the status of each alarm output module and each associated circuit for normal, activation, and trouble, and report any status or change thereof to the main system control panel/CPU. Each zone shall be equipped with a status and trouble LED indicator.

- H. Each alarm output circuit/zone shall be field programmable for silenceable or nonsilenceable operation. Specified control circuits shall be supervised via alarm output circuits and shall be programmed for nonsilenceable operation.
- I. Transponders shall be provided with auxiliary output/control relay modules as required. Each module shall provide eight SPDT (or four DPDT) field programmable output circuits. Output circuits shall be power limited. Each output shall be rated at 2 amps, 24 volts dc. Each circuit shall assume a designated and distinct address I.D. within the system and be field programmable for control by event actuation. Designated control circuits shall be provided with software assignable manual control switch as herein specified. The transponder shall monitor the status of each output module and associated circuit for normal, activated, and trouble conditions. Each circuit shall be equipped with an individual status LED indicator.
- J. The power supply for the panel and all fire alarm peripherals shall be integral to the control panel. The power supply shall provide all control panel and peripheral power needs with filtered power as well as 3.5 amperes of unregulated 24 volt dc power for external audio/visual devices. The audio/visual power may be increased as needed by adding additional modular expansion power supplies. All power supplies shall be designed to meet UL and NFPA requirements for power-limited operation on all external signaling lines, including initiating circuits and indicating circuits. All circuitry shall be UL listed for power-limited application.
- K. Input power shall be 120 volt ac, 60 Hz. The power supply shall provide internal supervised batteries and automatic charger. The power supply shall provide both positive and negative ground fault supervision, battery/charger fail condition, ac power fail indicators.
- L. Transponder shall be housed in key-locked steel cabinet painted in baked enamel finish. Cabinet door shall provide transparent glass window for viewing transponder indicators and controls. The cabinets shall be no more than 5" deep and 24" wide to conserve space. Cabinets shall be provided with conduit knockouts on sides and top for versatility in installation. The cabinet(s) shall be capable of accommodating multiple transponder units in a single enclosure.

2.08 REMOTE ANNUNCIATORS:

- A. Serial Annunciators: Notifier Model ACM or approved equal supervised remote LED annunciators shall be provided where indicated on the Drawings.
 - 1. Annunciators shall be field-programmable to annunciate selected given points and/or zones. Annunciators shall be field-configured as a remote system control and annunciator unit or as a "receive only" unit.
 - 2. Each annunciator shall provide [alarm and trouble LED's per annunciated point] [alarm LED per annunciated point].
 - 3. Each remote annunciator shall also contain a local alarm/trouble Piezo sounder and acknowledge/ lamp test switch. Each unit shall contain a common trouble LED and on line/pilot LED indicators. Zone LED indicators shall flash upon receipt of alarm (or trouble) conditions and revert to steady state upon system or annunciator acknowledgment. Local sounder shall silence upon acknowledgment.
- B. Graphic Annunciator: Notifier Auto-Plexor 2020 or approved equal microprocessor remote graphic annunciators shall be provided where indicated on the Drawings.
 - 1. The annunciator shall provide a custom graphic multicolor mylar layout of the building area and be back-lit with multicolored alarm LED indicators. Upon an alarm condition, appropriate LED illumination shall indicate from which area/zone the alarm was initiated. The annunciator shall also be provided with common alarm, common trouble and power pilot LED's. The annunciator shall contain an integral alarm/trouble buzzer with associated silence switch.
 - 2. The remote graphic annunciator shall communicate with the main fire alarm control unit CPU via a standard RS-232 interface port.

3. The annunciator shall be custom-programmed to display any alarm and/or trouble conditions from selected point(s). The unit shall have field-selectable multibaud rates and operate at 5 MHZ with no wait state. Internal microprocessor shall be supervised.
4. Each annunciator shall come equipped with integral alarm/trouble sonalert with silence switch and lamp test switch.

2.09 SMOKE AND HEAT SENSORS/DETECTORS: [Bob spec the dual technology detectors]

- A. Intelligent "Ceiling-mounted" Photoelectric Smoke Sensors: Notifier Model SDX 551 or approved equal analog photoelectric smoke sensors shall be provided where indicated on the Drawings.
1. The intelligent photoelectric smoke sensors shall connect via two wires to one of the intelligent control panel loops.
 2. The sensors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
 3. The sensors/control panel shall provide automatic sensitivity "drift" compensation to provide longer term stability and reliability. The sensor shall also provide a "maintenance alert" feature whereby the detector shall initiate a trouble condition should the units sensitivity approach the outside limits of the normal sensitivity window.
 4. The sensor shall be provided with extensive RF and EMF noise reduction circuitry.
 5. The sensor shall employ sophisticated self-compensating solid state LED light source and photosensitive circuitry.
 6. The sensor/control panel shall provide a calibrated test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic test switch, or may be activated remotely on command from the control panel.
 7. The sensors shall provide address-setting means on the sensor head using rotary decimal switches. No binary coding shall be required. The sensors shall also store an internal identification code which the control panel shall use to identify the type of sensor.
 8. The sensors shall provide dual alarm and power/status LEDs. Status LEDs shall flash under normal conditions, indicating that the sensor is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified. An output connection shall be provided in the base for connecting an external remote alarm LED.
 9. The sensor shall be semiflush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall also be suitable for surface-mounting below the raised floor or above the ceiling. Sensors shall be provided in smooth attractive white finish, and sealed against dirt, vermin, and back pressure. Sensors shall be provided with fine mesh insect/contaminate screen.
 10. Sensors shall be UL listed with respective control panel.
- B. Intelligent "Duct Mounted" Photoelectric Smoke Sensors: Notifier/BRK Model DHX Series duct-mounted intelligent photoelectric smoke sensor shall be provided where shown on the Drawings.
1. Sensors shall operate on the same principles and exhibit the same basic characteristics as area type "intelligent" smoke sensors. The unit shall be capable of interchanging/accepting either photoelectronic or ionization type sensors.
 2. The sensor shall operate in air velocities of 300 FPM to 4,000 FPM without adverse effects in detector sensitivity.
 3. Each sensor shall operate directly with the intelligent control panel loop, without an interface module.
 4. The unit shall consist of a Noryl molded plastic enclosure with molded integral conduit knock-outs. The unit shall be provided with clear faceplate cover to provide visual viewing of detector/sensor for monitoring sensor operation and chamber condition. The duct

- housing shall be provided with gasket seals to provide proper sealing of housing to mechanical ductwork and to ensure proper air flow into the detector sampling chamber. Duct housing shall be designed to easily mount to rectangular or round ducts.
5. The duct sensor unit shall be UL listed to the most current UL 268A standard and be cross-listed for use with the fire alarm control panel.
 6. Each duct sensor unit shall be equipped with sampling tubes protruding into the associated ductwork. Sampling tubes shall extend the width of the duct. Sampling tubes shall be provided with integral porosity filter system to aid in reducing detector contamination. Sensors shall be installed per NFPA 90A.
 7. Duct sensors shall be provided with remote alarm indicator (remote alarm indicator/test switch). Remote unit shall be mounted on single gang, stainless plate and be located in an accessible location for easy viewing and monitoring.
- C. Intelligent Ceiling Mounted Heat Sensors bob need for fixed
- D. Intelligent Ceiling Mounted Heat Sensors: Notifier Model FDX-551 analog thermal sensors shall be provided where indicated on the Drawings.
1. The intelligent thermal sensors shall connect via two wires to one of the intelligent control panel loops.
 2. The sensors shall use dual electronic thermostats to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.
 3. The sensors/control panel shall provide a test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the sensor itself, by activating a magnetic switch, or may be activated remotely on command from the control panel.
 4. The sensors shall provide address-setting means on the sensor head using rotary decimal switches. No binary coding shall be required. The sensors shall also store an internal identification code which the control panel shall use to identify the type of detector.
 5. The sensors shall provide dual alarm and power/status LEDs. Status LEDs shall flash under normal conditions, indicating that the sensor is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
 6. The sensor shall be semi-flush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall be provided in smooth white finish.

2.10 MANUAL STATIONS:

- A. Addressable Manual Stations: Notifier Model MS-F (special) flush mounted break glass type manual stations with an addressable interface module or approved equal shall be provided where indicated on the Drawings.
1. Manual stations shall be designed for flush mounting in the elevator lobby decorative stone or graphics panel and shall be constructed of bronze with recessed red areas marked "FIRE ALARM" and "PULL" in white text. Stations shall not have an integral firefighters telephone jack. Bronze finish shall match Architectural bronze in the area where the pullstation is installed.
 2. The manual station addressable module shall connect with two wires to one of the intelligent control panel loops.
 3. The module at the manual station shall, on command from the control panel, send data to the panel representing the state of the manual station switch.
 4. The manual station addressable module shall provide address-setting means using rotary decimal switches and shall also store an internal identification code which the control panel shall use to identify the type of device. No binary coding shall be required.
 5. A LED shall be provided on the addressable module which shall flash under normal conditions, indicating that the manual station is operational and in regular communication

with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been initiated via the station.

2.11 INPUT/OUTPUT DEVICES:

- A. Monitor Module (Addressable input Device): Notifier Model MMX-101 or approved equal addressable monitor modules shall be provided where required to interface to contact alarm devices.
1. The monitor module shall be used to connect a supervised zone of conventional initiating devices (any N.O. dry contact device, including 4 wire smoke detectors) to an intelligent loop.
 2. The monitor module will mount in a 4" square electrical box.
 3. The monitor module shall provide address-setting means using rotary decimal switches and shall also store an internal identification code which the control panel shall use to identify the type of device. No binary coding shall be required.
- B. Control Module (Addressable Output Device): Notifier Model CMX-1 or approved equal control/relay modules shall be provided where required to provide audible alarm interface and/or relay control interface.
1. The control module shall be used to connect a supervised zone of conventional indicating devices (any 24 volt polarized audiovisual indicating appliance) to an intelligent loop. The zone may be wired Class A or Class B field-selected. The control module may be optionally-wired as dry contact (Form C) relay.
 2. The control module will mount in a standard 4" electrical box.
 3. Power for the relay actuation shall be provided by the intelligent detector loop to reduce wiring connection requirements. Audio/visual power shall be provided by a separate loop from the main control panel or from supervised remote power supplies.
 4. The control module shall provide address-setting means using rotary decimal switches and shall also store an internal identification code which the control panel shall use to identify the type of device. No binary coding shall be required. A status LED shall be provided which shall flash under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED shall illuminate steady when the device is actuated via the Fire Alarm Control Panel.
- C. Auxiliary Control Relays: Air Products, Notifier or approved equal relays shall be provided for control interface. Relays shall be heavy duty type and rated up to 20 amps at 120 volts ac, 60 Hz. Relays shall be provided with NEMA 1 dust cover assembly and be provided with DPDT contacts.
- D. Sprinkler Waterflow and Pressure Switches: Switches shall be furnished and installed under Division 15, with wiring and addressable input device interface by this Contractor.
- E. Fire Protection OS&Y Valve Supervisory Switches: Switches shall be furnished and installed under Division 15, with wiring and addressable input device interface by this Contractor. Switches shall activate a supervisory signal within two turns of the valve or more than 1/3 of the valve travel toward the closed position.

2.12 ALARM SIGNAL DEVICES:

- A. Ceiling Mounted Fire Alarm Speakers in Finished Areas: Wheelock "E" Series or equal flush mounted fire alarm speakers shall be provided.
1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.
 2. Speakers shall be 4" round [square] with textured white decorative metal grill. Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.

3. Speakers shall be ceiling mounted and located as required by Section 403 of the international Building Code and as located on the drawings. Plastic speakers will not be acceptable.
- B. Ceiling Mounted Fire Alarm Speakers/Visual Signals in Finished Areas: Wheelock "E" Series flush mounted fire alarm speakers with integral visual alarm signals or equal shall be provided.
1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.
 2. Speakers shall be 4" round [square] with textured white decorative metal grill. Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.
 3. Speakers shall be ceiling mounted and located as required by Section 403 of the international Building Code, and as located on the drawings. Plastic speakers will not be acceptable.
 4. Visual alarm signals shall be integral with audible alarm device where shown on the drawings. Strobe lettering shall be oriented with lettering properly oriented with letters vertical, with strobe unit installed.
 5. Visual units shall be of the electronic flashing xenon strobe type and operate on 24 volts dc. Lights shall operate in unison with audible alarm signals and continue flashing upon silencing of alarm signals. Each unit shall produce 12,000 candle power.
 6. Visual shall be sychroniezed.
- C. Wall Mounted Fire Alarm Speakers/Visual Signals in Unfinished Areas: Wheelock "E" Series recess/surface mounted fire alarm speakers with integral visual signals or equal shall be provided.
1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.
 2. Speakers shall be 4" round [square] with textured white decorative metal grill. Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.
 3. Speakers shall be ceiling mounted and located as required by Section 1807 of the Uniform Building Code and as located on the Drawings. Plastic speakers will not be acceptable.
 4. Visual alarm signals shall be integral with audible alarm device where shown on the Drawings. Strobe lettering shall be oriented with lettering properly oriented with letters vertical, with strobe unit installed.
 5. Visual units shall be of the electronic flashing xenon strobe type and operate on 24 volts dc. Lights shall operate in unison with audible alarm signals and continue flashing upon silencing of alarm signals. Each unit shall produce 12,000 candle power.
 6. Visual shall be synchronized.

2.13 Fire alarm power boosters need spec

2.14 SYSTEM WIRING:

- A. The equipment supplier shall furnish to the installing contractor a complete detailed point-to-point wiring diagram showing the system equipment and required number, type and sizes of conductors and conduit sizes. Where common devices which break the alarm circuit are installed on a common zone with shorting type device, the circuit breaking devices shall be wired electrically downstream of the shorting type devices.
- B. All fire alarm system wiring which is exposed, concealed in inaccessible locations, wired between floors or wired between building smoke compartments shall be installed in an

approved raceway. Fire alarm wiring routed horizontally in concealed accessible locations may be installed using approved plenum rated fire alarm cable.

- C. All fire alarm system wiring shall be multiconductor, UL listed FPL for limited energy (300 volt) and fire alarm applications, and NEC approved fire alarm cable. Wiring shall be installed in accordance with NEC, local codes, Article 760 of NFPA Standard 70, and manufacturer's recommendations. All wiring shall be copper. Limited energy FPLP wire may be run open in return air ceiling plenums provided such wire is UL listed to UL TEST 910 for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article 760-4(d) if so approved by the local authority having jurisdiction.
- D. Fire alarm system wiring shall be color coded.
- E. All fire alarm system junction boxes including covers, shall be secured, painted red and marked in white lettering as specified in Section 26 05 53, "Identification for Electrical Systems".
- F. Wire size shall be determined by calculated voltage drop and circuit loading. Minimum wire size shall be as follows:
 - 1. #18 AWG twisted and shielded for data and communications circuits.
 - 2. #18 AWG for non-data and communications initiating and low voltage auxiliary control circuits.
 - 3. #16 AWG twisted for alarm circuits.
 - 4. #14 AWG for all power circuits.

PART 3 EXECUTION

3.01 INSPECTION:

- A. Installer shall examine the areas and conditions under which the fire alarm system is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 SYSTEM DESIGN:

- A. General: The basic equipment and device locations have been shown on the contract drawings. Specific wiring between equipment/devices has not been shown. It is the contractor's responsibility to submit for approval the COMPLETE ENGINEERED system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein.

3.03 PROGRAMMING:

- A. General: The manufacturer shall provide and install a menu driven software package, and shall provide all required programming of the system, including digitized voice alarms, graphics and action messages. Map and report formatting will be part of the software package. The software programming shall provide clear decision-making displays and text during critical alarm conditions that will allow the operator to make simple decisions during a crisis.
- B. Review: A hard copy of all graphic map displays will be presented to the Owner for review. Before the manufacturer loads the program the Owner shall be given the opportunity to review and approve all textural displays, messages and system sequences. After programming is completed the Owner shall be given a demonstration, on a color monitor, of screen displays and sequences under various alarm conditions.

3.04 INSTALLATION:

- A. General: Install system and materials in accordance with manufacturer's instructions, roughing-in drawings, and details on the Drawings. Install electrical work and use electrical products complying with the requirements of the applicable Division 26 sections of these Specifications. Mount manual stations and alarm devices at heights specified in Section 26 05 01, "Electrical Basic Materials and Methods".
- B. Wiring: All wiring shall be in accordance with NFPA 72, the National Electrical Code, Local Codes, and Article 760 of NFPA Standard 70. All wiring sizes shall conform to

recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.

1. Install fire alarm system line voltage and low-voltage wiring in a suitable raceway. Conceal fire alarm system conduit except in mechanical rooms and areas where other conduit and piping are exposed. Fasten flexible conductors, which bridge cabinets and doors, neatly along hinge side and protect against abrasion. Tie and support the conductors neatly.
 2. All wiring shall be run in a supervised fashion (i.e. no branch wiring or dog-legged wiring) per NFPA requirements such that any wiring disarrangement will initiate the appropriate trouble signals via the main control panel per NFPA and UL requirements. Intelligent SLC loops may be T-tapped/branch wired due to inherent dynamic supervision.
 3. Wiring splices shall be kept to a minimum with required splices to be made in designated terminal boxes or at field device junction boxes. Transposing or color code changes of wiring will not be permitted. End-of-line supervisory devices shall be installed with the last device on the respective circuit. Said device shall be appropriately marked designating it as the terminating device on the respective circuit.
 4. No AC wiring or any other wiring shall be run in the same conduit as fire alarm wiring.
 5. Number code and color code conductors appropriately and permanently for future identification and servicing of the system.
- C. Conduit/Raceway: All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.
1. Conduit and raceway system shall be installed as specified other Sections of the Specifications.
 2. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings. Conduit and raceway system shall be installed as specified under the general electrical sections of the specifications and per NEC. Maximum conduit "fill" shall not exceed 40% per NEC.
 3. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed and subject to damage.
 4. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.
- D. Labeling: All system controls, indicators and other devices shall be labeled with names, designations and operating instructions as applicable. Labels shall be either engraved nameplates or covered printed labels and shall be approved by the Engineer. All water flow switches which are hidden shall have identification points. These identification points shall be red tags with white lettering indicating location of the water flow switch. Tag location will be visible from corridors.
- E. Checkout: Check wiring to ensure that wiring is in accordance with the system manufacturer's wiring diagrams and that the system is free of open circuits, short circuits, and grounds.
- F. Identification: Refer to Section 26 05 53, "Identification of Electrical Systems", for additional requirements concerning painting, nameplates, and labeling.

3.05 COORDINATION:

- A. It shall be the responsibility of the installing contractor to coordinate all requirements surrounding installation of the fire alarm system with all trades. Adequate coordination shall be provided to ensure proper installation and interface to all peripheral items required to interact with the fire alarm to provide a complete and functional life safety system.
- B. The installing contractor shall be fully responsible for coordinating all system and device messages and system operation with the Owner's Representatives and Operating Personnel.

3.06 SYSTEM CHECKOUT AND TEST:

- A. All final control panel connections shall be made by a state licensed, factory-trained technical representative of the manufacturer and who shall supervise a System Checkout and Test to demonstrate and confirm to the Engineer, Owner's Representative and the fire department, that the fire alarm system is 100% operational upon completion of the installation, and that it complies with all local code requirements and these specifications. It is intended that the System Checkout and Test be followed by a continuing program of inspection testing and maintenance. The Contractor shall provide a proposal to the Owner for a Maintenance, Inspection and Quarterly Testing Contract in compliance with NFPA 72H, upon completion and system checkout.
- B. The System Checkout and Test shall be performed within 30 days after the fire alarm installation and all peripheral systems are completed. The System Checkout and Test shall be performed by a minimum of two licensed fire alarm system technicians, one of which is licensed by the State of Texas, and acceptable to the Engineer and the authority having jurisdiction. The test shall be performed in two parts and two-way radios for use by the test observers shall be provided. The first part shall be a full dry-run test with all subcontractors present, but without the Owner's Representative or fire department present. After the dry-run test is successfully completed, then the final test with the Owner's Representative and fire department present shall be performed.
- C. This Contractor shall coordinate the test schedule with all necessary parties and subcontractors required to be present for a complete and functional test.
- D. The System Checkout and Test which is a comprehensive 100% inspection and test of all fire alarm system equipment and shall include, but not be limited to the following:
 1. Fire Alarm Control Equipment:
 - a. A visual and functional test of all fire alarm control and auxiliary control equipment.
 - b. A visual inspection shall be conducted to establish that all electrical connections and equipment as required are properly installed and operating.
 - c. A remote functional fault simulation test shall be conducted on all relevant field wiring terminations to ensure that all wiring is properly supervised as required.
 - d. All indicators shall be tested to ensure proper function and operation.
 - e. All device messages shall be verified to be correct, as installed.
 - f. All system auxiliary functions including, but not limited to, CPU reporting, elevator recall, fire/ smoke door and shutter control, security interface, HVAC equipment control and shutdown, smoke control initiation, and other specified control functions shall be functionally tested to verify proper operation and proper system messages.
 - g. Control panel supervisory and alarm current readings shall be taken to verify that the control panel has the appropriate power supplies and standby batteries to operate the system as required. A 3 minute general alarm stress test both under ac power and standby power shall be conducted to further ensure complete operation of the system.
 - h. The Voice Communication System shall be visually and functionally tested to verify proper operation. Voice paging zoning shall be verified and automatic and manual operation of the voice paging system shall be fully verified. Self-monitoring functions of the voice paging system shall be verified.
 - i. The Firefighters' Telephone System shall be functionally tested to verify proper zoning, supervision and operation of each firefighters' telephone jack location.
 - j. The firefighters' HVAC system override panel shall be 100% functionally tested to verify that all control switches and indicators function as specified.
 2. Annunciators: All annunciators shall be tested to ensure that each point activates properly and labeling correctly defines the area of alarm.
 3. Fire Alarm Peripheral Devices: All fire alarm peripheral devices shall be functionally tested and the location and testing information recorded for each device.
 4. Initiating Devices (Manual and Automatic):

- a. All manual and automatic initiating devices shall be inspected to ensure proper placement and mounting as recommended by the manufacturer and as indicated in these specifications.
 - b. All manual fire alarm stations and all automatic initiating devices (smoke detectors, heat detectors, waterflow switches, etc.) shall be functionally tested for alarm operation.
 - c. A minimum of 10% of initiating devices shall be functionally tested for proper wiring supervision. Failure of any tested device on any zone shall require that all devices in that zone shall be tested for supervision.
 - d. All device messages shall be verified to be correct as installed.
5. Alarm Signaling Devices:
- a. All visual alarm indicators and exit sign flashing shall be functionally tested to ensure proper operation and that they are clearly visible.
 - b. Alarm signaling devices shall be field-checked and tested for proper operation and output.
 - c. Decibel reading shall be taken to ensure that the alarm signal level can be clearly heard in all areas of the facility, if required by the authority having jurisdiction. Additional devices may be required to provide adequate sound penetration (or as required by the local authority having jurisdiction). Contractor shall provide a unit price for such devices should they be required.
 - d. A minimum of 10% of the alarm signaling device shall be functionally tested for proper wiring supervision.
6. Reporting:
- a. Upon completion of the 100% System Checkout and Test, four copies of the final report shall be documented, certified, and sent to the Engineer for distribution to the Owner or authorized Owner's Representative indicating that all fire alarm equipment has been tested and is 100% operational.
 - b. The final report shall be generated by the equipment manufacturers headquarters or authorized representative to ensure integrity and uniformity of all testing procedures and reporting. The report shall contain the testing information, stating the precise location and operational status of each and every peripheral device and shall include a Fire Alarm System Certification and Description Document per NFPA 72.
 - c. The 100% System Checkout and Test shall be performed by factory-trained representatives, and one of the individuals shall possess a state license for fire alarm installation supervision.

3.07 TRAINING:

- A. Upon completion of the installation, the equipment manufacturer shall furnish his services for a period of 8 hours of demonstration and training in the use of the system and its connected equipment. The 8 hour training period shall consist of operations and trouble shooting and technical trouble shooting of the fire alarm panel and system. All training shall be provided at the site.

3.08 AS-BUILT/RECORD DRAWINGS:

- A. Two sets of manuals and as-built drawings shall be provided by the Contractor. The as-built drawings shall include a reproducible drawing and two copies of each as-built drawing. The drawings and manuals shall be used in the training sessions. At this time, manuals describing the system equipment, as-built wiring diagrams, system keys, and certification of a 100% system audit will be delivered to the Owner. Record drawings shall include, but not be limited to:
1. As-built wiring and conduit layout diagrams incorporating wire color code and/or label numbers and showing all interconnections in the system.
 2. Actual locations of each input and output circuit termination, the identification marking of each circuit and the address of each device. Provide an input/output assignment chart. A unique identification number shall be assigned to each alarm initiating device. Identification should be by zone number permanently mounted adjacent to the device or its mounting base. Markings with felt tip pens will not be acceptable.
 3. As-built schematic wiring diagrams of all control panels, modules, annunciators and communications panels.
 4. As-built heat and smoke detector location drawings showing location dimension of each detector and alarm box.
 5. Copies of the manufacturers technical literature on all major parts of the system including detectors, manual stations, signaling appliances, alarm panels. communication panels and equipment and power supplies.
 6. Completed Fire Alarm System Certification and Description Document.
- B. Refer to Section 26 00 01, "Electrical General Provisions", for additional As-Built/Record Drawings requirements.

3.09 OPERATING AND MAINTENANCE DATA:

- A. The manufacturer's authorized representative shall instruct the Owner's designated employees in the proper operation of the system and all required periodic maintenance. This instruction will include three copies of a written summary in booklet or binder form so employees can retain for future reference. Basic operating instructions for the system shall be framed and mounted at the main control unit. Refer to Section 26 00 01, "Electrical General Provisions", for additional requirements.

3.10 WARRANTY:

- A. The fire alarm and security systems shall be warranted against defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance by the Owner. Any equipment shown to be defective shall be repaired, replaced or adjusted free of charge.
- B. The warranty period shall begin after successful completion of the Owner's inspections and tests. In the event of any system malfunctions or nuisance alarms, the Contractor will take appropriate corrective action. This action may necessitate a repeat of the response test if the Owner so desires. Continued improper performance during warranty shall be cause to require the Contractor to remove the system.
- C. The warranty start date will not begin until after a period of 30 consecutive days of system operation without any nuisance alarms caused by malfunctioning of hardware or software.

END OF SECTION 28 31 03
E&C Engineers & Consultants Inc.
TX Firm Registration No. F-003068

SECTION 31 00 01 - SITE EARTHWORK

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform all excavation, backfill, fill and grading required to complete the work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; excavation and backfill for electrical manholes, handholes, conduits, cables, raceways and ducts; embankment and grading; disposal of waste and surplus materials; and all related work such as sheeting, bracing, and dewatering.
- B. All excavation, trenching and related sheeting, bracing, etc., shall conform to the requirements of OSHA's excavation safety standards, 29 CFR 1926.650 Subpart P.
- C. Excavation, backfill, and compaction for structures and piping are included in other sections as listed below.

1.2 RELATED WORK

- A. Section 31 23 00 – Grading Excavation and Fill
- B. Section 33 05 28 – Trenching and Backfill for Utilities

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 - Specification for Concrete Aggregates.
 - 2. ASTM D1557- Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,00 ft-lbf/ft (2,700kN-m/m)
 - 3. ASTM D1682- Standard Test Methods for Breaking Load and Elongation of Textile Fabrics.
 - 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.
 - 5. ASTM D4751- Standard Test Method for Determining the Apparent Opening Size of a Geotextile.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 PROTECTION

- A. Sheeting and Bracing

1. Furnish, put in place and maintain such sheeting and bracing as may be required: by Federal, State and local safety requirements; to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill.
2. In order to protect adjacent structures, installation or removal of sheeting by vibratory or hammering methods shall not be allowed.
3. Construct the sheeting outside the neat lines of the foundation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.
4. Where sheeting and bracing is required to support the sides of excavations for structures, engage a professional Engineer, registered in the State of Texas to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional Engineer. Submit P.E. Certification Form to show compliance with this requirement.
5. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed.
6. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe and under no circumstances shall any sheeting be cut off at a level lower than 1-ft above the top of any pipe.

B. Pumping and Drainage

1. At all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. Engage a Geotechnical Engineer registered in the State of Texas to design the dewatering system.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Well or sump

installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Take all additional precautions to prevent uplift of any structure during construction.
4. Remove the dewatering equipment after the system is no longer required.

1.5 SOIL TESTING

- A. Previous to the general placement of the fill and during such placement, the ENGINEER may select areas within the limits of the fill for testing the degree of compaction obtained. Cooperate fully in obtaining the information desired.
- B. Payment for testing will be made by the CONTRACTOR as part of the project. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the ENGINEER, will be borne by the CONTRACTOR.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Select Common Soil and Structural Fill shall be as specified in Section 31 00 00 – Earthwork.
- B. Crushed Stone
 1. Crushed stone shall conform to Texas Department of Transportation Class 57 stone gradation.
- C. Screened Gravel
 1. Screened gravel shall be used for pipe bedding as detailed and at other locations indicated on the Drawings.
 2. Screened gravel shall consist of hard, durable, rounded or subangular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. The gravel shall be graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
5/8-in	100
1/2-in	40 to 100
3/8-in	15 to 45
No.10	0 to 5

PART 3 – EXECUTION

3.1 BACKFILLING - COMMON FILL

- A. Common Fill may be used as trench backfill and fill against exterior walls of structures as indicated on the Drawings; as embankment fill; or in other areas as designated by the ENGINEER. Material conforming to the requirements of common fill shall be placed in layers having a maximum thickness of 2-ft measured before compaction.
- B. Common Fill shall be compacted to at least 95 percent of maximum density as determined by ASTM D1557, Method D.
- C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowance for settlement of the material and for the placing of loam thereon.
- D. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan and no soft spots or uncompacted areas will be allowed in the work.
- E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

3.2 DISPOSAL OF SURPLUS MATERIAL

- A. No excavated materials shall be removed from the site of the work or disposed of, except as specified by the ENGINEER. Materials shall be neatly piled so as to inconvenience as little as possible the public and adjoining property OWNERS until used or otherwise disposed of as specified below.
- B. Suitable excavated material shall be used for fill embankments or backfill on the different parts of the work as required.
- C. Surplus fill shall become the property of the CONTRACTOR and shall be removed and disposed offsite.

3.3 DISPOSAL AND REPLACING OF ROCK

- A. Remove and dispose of all pieces of ledge and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere on the work, insofar as it is available. Any deficiency in the backfill material shall be made up with acceptable material approved by the ENGINEER.
- B. Fragments of ledge and boulders smaller than 50 lb weight may be used in backfilling trenches unless in the opinion of the ENGINEER the quantity is excessive, in which case he/she may order the removal and disposal of some of this rock. The small pieces of rock used as backfill shall not be placed in trenches until the pipe has at least 2-ft of earth over it. Place these pieces of stone in thin layers alternating them with earth to be sure that all voids between the stones are completely filled with earth to prevent the occurrence of voids and settlement which will result therefrom.

- C. Rock may be used in embankment fill only with the approval of the ENGINEER.

3.4 GRADING

- A. Grading in preparation for placing of loam, planting areas, paved walks and drives and appurtenances shall be performed at all places that are indicated on the Drawings, to the lines, grades and elevations shown and otherwise as directed by the ENGINEER and shall be performed in such a manner that the requirements for formation of embankments can be followed. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.
- B. If at the time of grading it is not possible to place any material in its final location, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.
- C. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.
- D. Stones or rock fragments larger than 4-in in their greatest dimensions will not be permitted in the top 6-in of the finished subgrade of all fills.

END OF SECTION 31 00 01

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for site clearing which may consist of:
1. Protection of trees indicated to be preserved.
 2. Protection of above-ground and below-ground existing improvements indicated to be preserved.
 3. Clearing, grubbing, removal and disposal of trees, stumps, brush, roots, vegetation, logs and rubbish.
 4. Removal and disposal of above-ground and below-ground materials and existing improvements, including building demolition if any, as indicated.
 5. Stripping and stockpiling of topsoil.
 6. Stripping and stockpiling natural leaf mulch.

1.2 SUBMITTALS (NOT USED)

1.3 JOB CONDITIONS

- A. Conduct demolition operations and removal of debris in accordance with governing regulations and Section 024117 - Demolition of these Specifications.
- B. Ensure minimum interference with adjacent occupied or used facilities.
- C. Exercise care to protect adjacent building, structures, and persons.
- D. Above-ground and below-ground existing improvements, indicated to remain, shall be protected from damage prior to and during construction operations.
- E. Tree Protection
1. Trees to be preserved shall be protected by barricades to avoid any confusion and damage prior to site clearing operations.
 2. Contractor shall install barricades 3 ft. beyond drip line of trees to be protected. Construction equipment or storage activities shall not be permitted within the fenced area.
- F. Protection of Existing Utilities and Adjacent Work
1. Prior to earthwork operations, existing utilities, facilities and permanent objects to remain shall be located and adequately protected. When working near public and private utility company lines, Contractor shall contact the local utility coordinating committee, or the utility company involved to locate their lines.

2. If unknown and uncharted utilities are encountered during excavation, promptly notify Owner and the governing utility company when determinable and wait for instructions.
3. If it is determined by Owner that such utility line has been abandoned, properly cap line at a depth approved by Owner or remove line as directed.
4. If such unknown utilities are encountered and work is continued without contacting the Owner for instructions, and the encountered utilities are damaged by continuation of the work, Contractor shall repair, at this own expense, such damage to the satisfaction of the Owner and the Utility Company. The Contractor shall be responsible for all costs to repair the damage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING

- A. Trees to be removed, stumps, brush, roots and vegetation shall be removed to a depth of not less than 2 feet below original or finish ground level, whichever is lower.
- B. Miscellaneous vegetation, logs and rubbish shall be removed in their entirety, within the limits of improvements.
- D. Topsoil shall be stripped to underlying subsoil. Topsoil shall be defined as friable organic clay loam surface soil, reasonably free of clay lumps, stones, weeds, roots and other objectionable material. Topsoil shall be safely stockpiled on the Site. Stockpiles shall be constructed to freely drain surface water.
- E. Depressions caused by clearing, grubbing and stripping operations shall be filled with approved backfill material, unless further excavation is required by the construction operations. Backfill shall be placed in accordance with Section 312300 – Excavation, Grading, and Fill of these Specifications.

3.2 REMOVAL OF IMPROVEMENTS

- A. Above-ground and below-ground existing improvements shall be removed in their entirety, except for utilities which shall be removed only to the extent indicated. Where utilities are indicated to be removed in part, the ends of the remaining utilities shall be permanently plugged with Class 3000 concrete.

3.3 DISPOSAL OF MATERIALS

- A. Materials not scheduled to be salvaged shall become the property of the Contractor and shall be removed from the Site and legally disposed of. Burning or burying cleared, grubbed and demolition waste materials on the Site shall not be permitted.
- B. Remove items, without damaging, scheduled to be salvaged as directed by the engineer and placed in designated storage area.

END OF SECTION 31 11 00

SECTION 31 23 00 – GRADING, EXCAVATION AND FILL

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Protection of Trees
- B. Field Engineering for Site Layout.
- C. Testing Laboratory Services.
- D. Fill Material for Pavement Subbase.
- E. Concrete Reinforcing.
- F. Cast-In-Place Concrete.
- G. Informational Reference to Site Survey and To Subsurface Conditions.

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. ASTM D 698, Test for Moisture-Density Relations of Soils (Standard Proctor).
 - 2. ASTM D 2922, Test for Density of Soil in Place by Nuclear Method.
 - 3. ASTM D 2487, Classification of Soils for Engineering Purposes.

1.3 SUBMITTALS

- A. SAMPLES:
 - 1. Submit 10-pound sample quantity of fill materials.
 - 2. Submit 20-pound sample quantity of topsoil material.
 - 3. Pack tightly in containers to prevent contamination.

1.4 GRADES

- A. Carefully compare new grade requirements with existing conditions.
- B. Provide necessary earth, grading and shaping work.
- C. Extra payment will not be authorized for overage or shortage of material.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Sub base material: unwashed pit run or crushed gravel, crushed stone, or crushed slag, naturally or artificially graded with maximum aggregate size of 1-1/2 inches, as acceptable to testing laboratory.
- B. Backfill and fill material: soil materials free of debris, waste, frozen matter, vegetable and other deleterious matter, as acceptable to testing laboratory.
- C. Select fill: imported lean clay with a narrow plasticity index (pi) range of 10 to 15.
- D. Lime treated structural fill: on-site clay mixture, free of silt, loam, friable or soluble materials and organic matter; treated in 6-inch lifts with 36 pounds per square yard of hydrated lime.
- E. Backfill:
 - 1. Free from rocks larger than 3 inches in size, alkali, salt, petroleum products, debris, waste, roots, vegetable, and other deleterious matter.
 - 2. Excess non-vegetated excavated soils available from site may be used if conforming to specified requirements.
- F. Lime: material conforming to SDHPT item 264, "hydrated lime and lime slurry".
- G. Soil filter fabric: Irafi "1405" is specified; Dupont "Tyvar" is acceptable or approved equal.

PART 3 – EXECUTION

3.1 OBSTRUCTIONS

- A. Remove obstructions within lines of improvements.
- B. Refer obstructions of questionable nature to engineer.
- C. Remove abandoned foundations down to 12 inches below finished grade, or the finished elevation of pavements and walks unless indicated otherwise on the drawings.
- D. Remove foundations of light standards completely.

3.2 STRIPPING

- A. Strip entire area to receive pavement and slabs on grade to a minimum depth of six inches to remove soil containing vegetated material.
- B. Remove vegetated material from site as waste.
- C. Remove topsoil; spread on areas already graded and prepared for topsoil, or deposit in storage piles convenient to areas subsequently to receive topsoil.

- D. Scarify existing asphalt surfacing and flexible base course material and remove from site.
- E. Remove existing site improvements in areas scheduled to receive lawns, buildings, and pavements.
- F. Stripped material becomes property of contractor; remove from project site immediately and dispose of properly.
- G. Maintain site surface drainage during construction.

3.3 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate using ladder-type trenching machine or backhoe unless indicated otherwise.
- B. Cut trench sides vertical from trench bottom to one foot above top of pipe; slope back on stable slope above that point.
- C. Extend trench width minimum 6 inches and maximum 18 inches each side of pipe.
- D. Excavate trench to a minimum depth of 4 inches below bottom elevation of proposed pipelines.
- E. Leave no more than 500 feet of trench open at one time.
- F. Where augured hole is indicated, provide opening no larger than one inch greater than outside diameter of pipe bell.

3.4 DEWATERING

- A. Keep excavations dry; maintain dewatered condition for depth of one foot below excavation bottom.
- B. Operate suitable pumps necessary to keep excavations continuously free of water.
- C. Discharge drainage waterlines into approved sewers only with appropriate approvals; use of sanitary sewer is prohibited.
- D. Direct surface drainage away from excavated areas.
- E. Control grading adjacent to excavations to prevent water running into excavated areas.

3.5 PERIMETER BACKFILL

- A. Backfill exterior side of perimeter of structure with lime-treated on-site clay materials, carrying such fill up to indicated sub grades.
- B. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
- C. Commence backfilling after underground work has been inspected, tested, forms removed, and excavation cleaned of trash and debris.

- D. Place and compact backfill to minimize settlement and avoid damage to work in place.
- E. Place backfill simultaneously on both sides of freestanding structures; prevent wedging action against structure.
- F. Place materials in successive horizontal layers of not more than 8 inches (4 inches for hand-held tamping equipment) and uniformly compacted to 92% of maximum density as confirmed by testing laboratory.

3.6 UTILITY TRENCH BACKFILL

- A. Pipe bedding and backfill requirements for sanitary sewers shall be as specified in Section 333100, Sanitary Sewage Systems.
- B. Pipe bedding and backfill requirements for storm sewers shall be as specified in Section 334100, Storm Sewage Systems.
- C. Pipe bedding and backfill for water distribution system piping shall be in accordance with City of La Marque "Specifications for Water Main Construction and Materials" and "Specifications for Water Taps and Service Lines", 3/4-inch through 2-inch, with latest addenda and amendments thereto.
- D. Backfill trench as soon as possible after pipe has been laid, jointed, and inspected; complete backfilling at end of each day.
- E. Within pipe zone: place backfill material and hand tamp in 6-inch layers to one foot above top of pipe.
- F. Use of bulldozer or similar tracked equipment is unacceptable for compaction.

3.7 PREPARATION OF SUBGRADE FOR PAVING, WALKS AND EXTERIOR SLABS

- A. Cut and fill areas as required.
- B. Proof roll sub grade with heavy roller. Cut out any soft area that cannot be compacted by surface rolling and replace with compacted select fill.
- C. Provide select fill at areas where required to elevate sub grade. Lime stabilization: stabilize to depth of 8 inches with lime slurry in accordance with TxDOT Item 260. **Subgrade beneath sidewalks shall not be lime stabilized.**
- D. Compact to not less than 85 to 92% of maximum density in accordance with ASTM D698 as confirmed by testing laboratory; with moisture content for compacted material within +/- 2% of optimum moisture.
- E. Maintain site surface drainage during construction.

3.8 ROUGH GRADING

- A. Shape sub grade to allow for maximum amount of natural settlement and compaction.

- B. Remove debris, roots, branches, stones, in excess of 2 inches in size.
- C. Remove subsoil which has been contaminated with petroleum products.
- D. Excavate areas, to sub grade elevation, which are to receive paving and sidewalks.
- E. Bring sub grade to required levels, profiles and contours, making gradual changes in grade; blend slopes into level areas.
- F. Slope grade away from building minimum 2 inches in 10 feet unless indicated otherwise.
- G. Cultivate sub grade to a depth of 3 inches where topsoil is to be placed; repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub grade.
- H. Maintain site surface drainage during construction.

3.9 SURPLUS MATERIALS

- A. Remove surplus subsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

3.10 CLEAN-UP

- C. Remove temporary structures, rubbish, and waste materials from work site daily.

END OF SECTION 31 23 00

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. This Section pertains to the provisions for the control of erosion in the construction area and in stockpile areas including seeding, the construction of temporary swales and sedimentation basins as required and shown on the drawings. All areas where existing vegetation and grass cover have been bared by construction activities shall be protected from erosion.
- B. Contractor is responsible for meeting all local, state and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System, Phase II, regulations from the Clean Water Act.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including A-Procurement and Contracting Requirements, Division 00 and Division 01 apply to this section.
- B. Section 31 11 00 Clearing and Grubbing
- C. Section 31 23 00 Grading Excavation and Fill
- D. Section 33 05 28 Trenching and Backfill for Utilities
- E. Section 33 40 00 Drainage
- F. Texas Department of Transportation's Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014)

1.3 PERMITS (NOT USED)

1.4 APPLICABLE PUBLICATIONS (NOT USED)

1.5 PROTECTION OF ADJACENT WORK (NOT USED)

1.6 DEFINITIONS

- A. Best Management Practices (BMP's) means physical facilities schedules of activities, prohibition of practices, maintenance procedures, and other management practices , when properly designed, installed, and maintained, will be effective to prevent or reduce the discharge of pollution associated with construction activities. BMP's also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

- B. Block Sodding: Sodding for erosion control and for final stabilization shall consist of providing and planting Bermuda grass, San Augustine grass, or other acceptable sod along or across such areas as are designated on the drawings and in accordance with the specification requirements herein outlined.
- C. Hydromulch Seeding: Seeding, followed by the application of a mulch erosion control blanket shall consist of preparing the ground, sowing of seeds, application of a fertilizer, and stabilization with mulch consisting of a biodegradable fiber along and across such areas as are designated on the plans and in accordance with these specifications
- D. Silt Fence: The reinforced filter fabric barrier consists of geotextile fabric supported by a net reinforced fence stretched across and attached to supporting posts or frame and entrenched. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.
- E. Inlet Protection Barriers: The inlet protection barrier consists of a geotextile fabric (filter fabric) supported by a net reinforced fence structure and constructed around a storm drain inlet, catch basin, or culvert. An alternative design of the inlet protection barrier, as approved by the Engineer, consists of fiber rolls placed around a frame, staked in place (or weighted down with clean gravel bags), and constructed around a storm drain inlet, catch basin or culvert. This work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation. As designated on the plans and in accordance with these specifications.
- F. Sediment Basins: A sediment basin is a temporary basin or dam constructed across a waterway or excavated location to intercept sediment-laden runoff and to trap and retain the sediment. A sediment basin is usually installed at points of discharge from drainage areas greater than 5 acres. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.
- G. Stabilized Construction Access: This work shall consist of the installation of temporary erosion protection and sediment control stabilized construction access - type I, rock, utilized during construction operations and prior to final stabilization, in accordance with these specifications and construction drawings
- H. Rock Filter Dams: Rock filter dams are temporary berms constructed of stone to intercept and slow storm water runoff to retain sediment on the construction site.
 - 1. Depending upon the type of rock filter dam specified in the construction plans as Type 1, 2, 3, or 4, the aggregate fill may be unwrapped, wrapped in twisted hexagonal wire mesh, or confined in a gabion wire basket. Applications of Rock Filter Dams are as follows:
 - a. Type 1 dams may be used at toe of slopes, around inlets, in small ditches, and at dike or swale outlets. Type 1 dams are recommended for erosion and sediment control from a drainage area of 5 acres or less.
 - b. Type 2 dams may be used in ditches and at dike or swale outlets.
 - c. Type 3 dams may be used in stream fl
 - d. Type 4 sack gabions may be used in ditches and smaller channels to form an erosion and sediment control dam

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Install and maintain erosion control systems in compliance with all authorities having jurisdiction.

1.8 PROJECT/SITE CONDITIONS (NOT USED)

1.9 SUBMITTALS (NOT USED)

PART 2 – PRODUCTS

2.1 SUSTAINABLE MATERIALS

- A. Contractor shall strive to utilize sustainable materials, which include rapidly renewable materials, regional materials, regionally manufactured materials, regionally extracted materials, recycled contents.

2.2 GRASS

- A. Materials for erosion control seeding shall conform to TxDOT Item 164.
- B. Materials for erosion control sodding shall conform to TxDOT Item 162.

2.3 FERTILIZER

- A. Materials for fertilizing erosion control seeding and/or sodding shall conform to TxDOT Item 166.2

2.4 WATER

- A. Use clean potable water for maintaining the grass developed after erosion control seeding and/or sodding. Water shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.
- B. Water sources other than the local municipal domestic water supply must be approved by the Owner.
- C. If onsite reclaimed water sources are used, tanks and appertices must be clearly marked with the words “non-potable” water.

2.5 SILT FENCE

- A. Geotextile fabric for Silt Fences must meet the TxDOT Departmental Material Specifications DMS 6230 Temporary Sediment Control Fence Fabric.

2.6 STRAW BALES

- A. Standard rectangular hay bales bound by baling wire, clean and dry

2.7 INLET PROTECTION BARRIERS

- A. Geotextile per 2.5 Silt Fence above.
- B. Hardwood Posts shall be 2x2 minimum length 4 feet.
- C. Net reinforced fence shall be 2 inch by 4 inch welded wire fabric mesh. The mesh support height shall be the equivalent height, or greater, of the geotextile fabric to be attached.

2.8 STABILIZED CONSTRUCTION ACCESS

- A. Materials to be per TxDOT spec section 506.2.E.1 for Type 1

2.9 ROCK FILTER DAM

- A. Materials. Geotextile fabric shall consist of a woven monofilament or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Geotextile fabric shall equal or exceed the following average roll values or as directed by the Engineer:
 - 1. Minimum average roll value.
 - a. Elongation – 50 percent.
 - b. Grab Strength – 200 pounds.
 - c. Puncture Strength – 75 pounds.
 - d. UV Stability (retained strength) – 50 percent after 500 hours of exposure.
 - 2. Maximum average roll value.
 - a. Apparent Opening Size (AOS) – 0.6 mm/#30 US sieve.
- B. Geotextile fabric shall be resistant to commonly encountered soil chemicals, mildew, rot, insects, and deterioration resulting from exposure to sunlight or heat. Geotextile fabric shall provide an expected useable life comparable to the anticipated construction period.
- C. Aggregate for the rock filter dams shall consist of crushed stone. Aggregate particles shall be composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials or organic and injurious matter. Aggregate shall be cubic or rounded form, not elongated, flat, shapes. Spalls, fragments, and chips shall not exceed 5 percent by weight. Crushed concrete shall not be substituted for the crushed stone unless as approved by the Engineer. Aggregate size shall depend upon the type of

rock filter dam specified in the construction plans. Aggregate size based on type of rock filter dam is as follows:

1. Type 1: 3 inches to 5 inches, open-graded.
 2. Type 2: 3 inches to 5 inches, open-graded.
 3. Type 3: 4 inches to 8 inches, open-graded.
 4. Type 4: 3 inches to 5 inches, open-graded.
- D. Mesh is required for reinforced type rock filter dams. Mesh shall be 20 gauge galvanized double twisted hexagonal wire mesh with 1-inch diameter hexagonal openings. Mesh wire shall be zinc coated prior to being double twisted. Reinforcing spiral binders, lacing wire, and stiffeners shall be made of wire having the same coating material and same wire size as the wire mesh. Gabion wire baskets shall equal or exceed the requirements of the wire mesh.

PART 3 – EXECUTION

3.1 GENERAL

- A. Protection
1. Protect benchmarks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs, and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement. If damaged or displaced, notify Engineer and correct defects as directed.
 2. Protect above and below grade utilities which are to remain.
- B. Preparation:
1. Use all means necessary to control dust on and near the work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the work of this Section, or if resulting from the condition in which Project Site is left by Contractor.
 2. Moisten surfaces, as required, to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on Project Site.
- C. Install erosion control systems at the site's boundary at locations where stormwater runoff will leave the site prior to starting any clearing, stripping, or earthwork operations
- D. Minimize the time areas are to be exposed without vegetative cover.
- E. Properly dispose of solid waste, paints, solvents, cleaning compounds, etc.
- F. Store construction materials in designated areas away from drainageways and low areas.
- G. Provide portable toilets and properly dispose of sanitary sewage.
- H. Construct containment berms and utilize drip pans at fuel and liquid storage tanks and containers.

3.2 INSTALLATION OF EROSION CONTROL DEVICES

- A. Install erosion control devices to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the work of this Contract.
 - 1. Implement erosion control measures indicated on drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.
- B. Install silt fence located along perimeter of site or grading limits immediately following site clearing operations specified under Division 31 Section 31 11 00 Clearing and Grubbing.
 - 1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.
 - a. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
 - 2. Drive support post into ground not less than 18 inches.
 - 3. Excavate a 4-inch-wide by 4-inch-deep trench on up-slope side of silt fence.
 - a. Line trench with silt fence fabric material.
 - b. Backfill trench with soil or gravel.
- C. Install straw bale fence at completion of grading operations in affected area as indicated on drawings.
 - 1. Install erosion control devices at storm sewer inlets immediately after completion of the storm sewer.
 - 2. Place straw bales in a single row, lengthwise on the contour, and embedded 4 inches into soil.
 - 3. Secure each individual bale in place by stakes or reinforcement bars driven through bales into the ground to a depth of not less than 18 inches.
- D. Install inlet protection barriers at curb inlets and at area inlets.
- E. Install straw bale fences as ditch checks in drainage ditches.
- F. Install Stabilized Construction Access per TxDOT specification 506.4.C.5.
- G. Rock filter dams shall be installed so as to prevent downstream deposition of sediment and debris from the construction site. Rock filter dams shall be constructed to meet the following criteria:
 - 1. Type 1:
 - a. Non-reinforced.
 - b. Height: 18-24 inches

- c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 2:1 maximum.
 - e. Open graded aggregate 3-5 inches.
2. Type 2:
 - a. Reinforced with wire mesh.
 - b. Height: 18-36 inches.
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 2:1 maximum.
 - e. Open graded aggregate 3-5 inches.
 3. Type 3:
 - a. Reinforced with wire mesh.
 - b. Height: 36-48 inches.
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 3:1 maximum.
 - e. Open graded aggregate 4-8 inches.
 4. Type 4:
 - a. Reinforced in a gabion wire basket.
 - b. Height: 30 inches minimum.
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slopes of dam: none specified.
 - e. Open graded aggregate 3-5 inches.
 5. The separation geotextile fabric and wire mesh shall be sized and placed in accordance with the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The separation geotextile fabric may be omitted only as approved by the Engineer. The separation geotextile fabric and wire mesh shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel prior to aggregate placement. Sack gabions for Type 4 rock filter dams

shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel, as well.

6. Aggregate fill shall be placed to the width, length, height and slopes in accordance with this specification and the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The height of the dam shall be measured vertically from the existing ground to the top of the filter dam. The length of the dam shall be measured across the top centerline of the dam from embankment to embankment and includes the additional length embedded into the embankment. Width of the dam shall be measured along the top face of the dam.
7. Wire mesh shall be folded upstream side over the aggregate fill and tightly secured to itself on the downstream side using wire ties. Hog rings may be substituted for wire ties.
8. Additional aggregate fill or gravel bags shall be placed and secured at the embedded section to prevent low flows from short circuiting the dam at the adjacent dirt embankment area.
9. The Contractor shall be responsible for periodic reshaping, repairing, and maintaining of rock filter dams as directed by the Engineer.
10. The Contractor is responsible for removal and proper disposal of sediment and debris from the rock filter dam. Removed sediment and debris shall not be allowed to flush into the storm sewer system, waterways, jurisdictional wetlands, or onto adjacent properties. Sediment deposits shall be removed before they reach one-third of the height of the dam. Uncontaminated sediment can be placed at the project spoil site or, if properly handled, spread out to supplement fill requirements. If sediment has been contaminated, then it shall be disposed of in accordance with the applicable federal, state, and local regulations. Offsite disposal shall be the responsibility of the Contractor. Contractor is encouraged to reuse aggregate and wire mesh if remaining materials meet original spec requirements.

3.3 EROSION CONTROL SEEDING

- A. Exposed fill and stockpile areas shall be protected from windborne erosion if the phasing of the construction operations is anticipated to leave the exposed fill and stockpile areas unattended for 6 weeks or more. At completion of stockpiling operations, stockpiles shall be shaped and graded to drain. Provide a layer of mulch to all sides of the stockpile to protect the stockpile from windborne erosion.
- B. Areas designated on the drawings to be seeded shall be seeded in accordance to the Texas Department of Transportation Standard Specifications, Item 164, titled "Seeding for Erosion Control". Broadcast seeding method shall be used as described in TxDOT, Item 164.4 unless otherwise instructed.
- C. Areas to be seeded with slopes steeper than 10H:1V shall also utilize a soil retention blanket as specified in TxDOT Item 169 Soil Retention Blanket.

3.4 TEMPORARY SWALES

- A. Temporary drainage swales shall be provided as required to carry drainage away from the work area to an approved outfall point.
- B. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least two (2) feet deep with a slope of 0.1%.

- C. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.
- D. Swales shall have erosion control barriers as required in these specifications.

3.5 FILL AND CUT SLOPES

- A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's Geotechnical engineer.
- B. When cut slopes exceed 2:1 for depths over three (3) feet, proper bracing and shoring per OSHA requirements shall be used and maintained.
- C. For permanent slopes, cut or fill, between 2:1 and 10:1, erosion protection shall be provided with hydromulching seeding, sodding, or other method as approved.
- D. Where cut slopes of more than 5 feet deep, extend more than 100 feet in length, contractor shall provide a backfill drain at the top of the slope to ease in drainage and erosion control.

3.6 SEDIMENTATION BASINS

- A. Sedimentation ponds shall be provided when designated on the plans.
- B. All drainage from cleared areas shall be routed through the sedimentation basin.
- C. Contractor will be responsible for the operation and maintenance of the pond during construction.

3.7 MAINTENANCE

- A. Check all erosion control measures after each rainfall event to ensure that they are in proper working order.
 - 1. Immediately restore all measures to installed condition.
 - 2. During the course of construction all temporary swales constructed for this contract shall be maintained so as to allow proper drainage from the construction area. Before Contractor leaves the site at the end of construction, all temporary swales must be reworked to meet final conditions as set forth in the drawings and specifications.
 - 3. The Contractor shall assure that all subwork with other contractors at the site understand the importance of the erosion control features. The Contractor shall require all subcontractors to respect the function of the erosion control features and enlist their coordination in maintaining existing swales and ditches.
- B. Inspect silt and straw bale fences at least once a week.
 - 1. Immediately replace damaged portions of the silt fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.
 - 2. Remove sediment deposits, as necessary, to provide adequate sediment storage and to maintain the integrity of fences. Dispose of accumulated sediment by spreading over upland areas of the site.
- C. Maintain erosion control devices in place, as specified, until completion of the work of this

Contract.

1. At completion of work, inspect all systems, make necessary repairs, remove and dispose of all accumulated sediment, and turn completely operable systems over to Owner for continued maintenance.
- D. Where necessary for equipment and vehicular access to the work areas, adequately sized culverts shall be installed and maintained to provide the access without disturbing the site drainage.
- E. Sedimentation Basins.
1. Contractor shall be responsible for maintaining the pond and the outfall and sediment retarding structure in good working condition throughout the time the pond is to be in operation.
 2. When sediment and debris fill the pond to over one third (1/3) its designed capacity, the pond shall be cleaned out.
 3. The sediment from the clearing operation shall be stockpiled with like materials per Specification 31 11 00 Clearing and Grubbing. If the material is found to not meet the stockpiling requirements listed in 31 11 00, they must be removed from the site as described in 31 11 00.

3.8 INSPECTIONS

- A. Inspect all erosion control systems and devices at least once every seven calendar days.
- B. Inspect all erosion control systems and devices within 24 hours of the end of any storm which results in precipitation of 1/2 inch or more.
- C. During inspections, locations where stormwater leaves the site shall be inspected for evidence of erosion or sediment deposition.
- D. Correct deficiencies within three calendar days.
- E. Complete a report of each inspection. Report shall contain the following minimum information:
 1. Inspector's name
 2. Inspection date
 3. Observations of the effectiveness of erosion control systems
 4. Actions taken if necessary to correct deficiencies
 5. Listing of areas where construction operations have permanently or temporarily stopped
 6. Authorized signature

END OF SECTION 31 25 00

SECTION 31 63 29
DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
1. Dry-installed drilled piers.
 2. Slurry displacement-installed drilled piers.
 3. Dry-installed or slurry displacement-installed drilled piers at Contractor's choice.

1.03 UNIT PRICES

- A. Unit prices are included in Section 01 22 00 "Unit Prices."
- B. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts and bells.
1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.
 2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.
- C. Trial Drilled Pier: Unit price as indicated for drilled pier, including backfilling.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.
- D. Material Certificates: For the following, from manufacturer:
1. Cementitious materials.

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- 2. Admixtures.
 - 3. Steel reinforcement and accessories.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
- F. Field quality-control reports.
- G. Other Informational Submittals:
- 1. Record drawings.
- 1.05 QUALITY ASSURANCE
- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.
- C. Drilled-Pier Standard: Comply with ACI 336.1 unless modified in this Section.
- 1.06 PROJECT CONDITIONS
- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
- 1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
- 1. Notify all affected parties including Owner no fewer than five (5) days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Owner's written permission.
- C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
- 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 - 2. The geotechnical report is referenced elsewhere in the Project Manual.
- D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
- 1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

- A. Refer Section 03 20 00.

2.02 CONCRETE MATERIALS

- A. Refer Section 03 30 00 and Structural General Notes.

2.03 STEEL CASINGS

- A. Steel Pipe Casings: ASTM A 283, Grade C, or ASTM A 36, carbon-steel plate, with joints full-penetration welded according to AWS D1.1.
- B. Corrugated-Steel Pipe Casings: ASTM A 929, steel sheet, zinc coated.

2.04 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.
- C. Proportion normal-weight concrete mixture as follows:
 - 1. As indicated in Structural General Notes.

2.05 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.06 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.02 EXCAVATION

- A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
 - 1. Obstructions: Unclassified excavation may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions.
 - 2. Obstructions: Unclassified excavated materials may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. Payment for removing obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work will be according to Contract provisions for changes in the Work.
- B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.
- C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
 - 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 - 2. Remove water from excavated shafts before concreting.
- D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
 - 1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
 - 2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.
- E. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.
- F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.
- G. Bells: Excavate bells for drilled piers to shape, base thickness, and slope angle indicated. Excavate bottom of bells to level plane and remove loose material before placing concrete.
- H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 - 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

3.03 STEEL REINFORCEMENT

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

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- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
 - C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.
 - D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
 - E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
 - F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.04 CONCRETE PLACEMENT

- A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
 - 1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.
- B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
 - 1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
 - 2. Vibrate top 60 inches of concrete.
- C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
 - 1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.
- D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Drilled piers.
 2. Excavation.
 3. Concrete.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities will be determined by testing and inspecting agency. Final evaluations and approval of data will be determined by Architect.
- D. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94.
1. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
 2. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and 80 deg F and above, and 1 test for each set of compressive-strength specimens.
 3. Compression Test Specimens: ASTM C 31; one set of four standard 6-inch x 12-inch cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.
 4. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and 1 specimen will be retained in reserve for later testing if required.
 5. If frequency of testing will provide fewer than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 6. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 8. Report test results in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 10. Additional Tests: Testing and inspecting agency will make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.

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- a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.
 - 11. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
 - 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports for each drilled pier as follows:
- 1. Actual top and bottom elevations.
 - 2. Actual drilled-pier diameter at top, bottom, and bell.
 - 3. Top of rock elevation.
 - 4. Description of soil materials.
 - 5. Description, location, and dimensions of obstructions.
 - 6. Final top centerline location and deviations from requirements.
 - 7. Variation of shaft from plumb.
 - 8. Shaft excavating method.
 - 9. Design and tested bearing capacity of bottom.
 - 10. Levelness of bottom and adequacy of cleanout.
 - 11. Ground-water conditions and water-infiltration rate, depth, and pumping.
 - 12. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary or permanent casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
 - 13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
 - 14. Bell dimensions and variations from original design.
 - 15. Date and time of starting and completing excavation.
 - 16. Inspection report.
 - 17. Condition of reinforcing steel and splices.
 - 18. Position of reinforcing steel.
 - 19. Concrete placing method, including elevation of consolidation and delays.
 - 20. Elevation of concrete during removal of casings.
 - 21. Locations of construction joints.
 - 22. Concrete volume.
 - 23. Concrete testing results.
 - 24. Remarks, unusual conditions encountered, and deviations from requirements.

3.06 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 63 29

SECTION 32 13 13 - PORTLAND CEMENT CONCRETE PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing, placing, curing and protecting Portland cement concrete paving, with or without reinforcement as indicated, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute
 - a. 301: Specifications for Structural Concrete for Buildings.
 - b. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.
2. ASTM: American Society for Testing and Materials
 - a. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (with Supplement + S1).
 - b. C 150: Specification for Portland Cement Type I or Type II.
 - c. C 309: Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - d. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - e. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
 - f. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).
 - g. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - h. D 3405: Specification for Joint Sealants, Hot-Poured, for Portland Cement Concrete Pavement.
3. TxDOT: Texas Department of Transportation.
 - a. Standard Specifications for Construction of Highways, Streets, and Bridges -- Latest Edition.
 - 1) Item 360, CONCRETE PAVEMENT.

B. Formwork Tolerances

Formwork tolerances shall be as specified in ACI 316 R, Chapter 5.

C. Finishing Tolerance

The top surface of pavement shall have a Class B tolerance as specified in ACI 316 R, Chapter 12.5 and ACI 301, Chapter 11.9.

D. The Portland Cement Paving Contractor/Subcontractor shall provide Owner with evidence of his/her ability to perform the specified work. This evidence shall be in the form of at least five (5) successfully completed Portland Cement paving projects.

This list of projects shall be submitted to Owner prior to any paving operations beginning so that Owner will be able to inspect the quality of workmanship at the site and approve the Contractor/Subcontractor.

1.3 SUBMITTALS

A. The following submittals shall be submitted:

1. Reinforcement Materials

a. As required in Section 032100 - Concrete Reinforcement.

2. Concrete Materials

a. As required in Section 321313.79 – Cast-in-Place Concrete.

3. Joint Materials

a. As required in Section 321319 – Concrete Pavement Joints.

1.4 EXTENDED WARRANTY

A. Manufacturer of joint sealant shall provide at least a 1-year written warranty against material degradation or failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit Owner's rights or remedies as may otherwise be afforded under law or statute.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Forms

Metal forms, as indicated in ACI 316 R, Chapter 5.

B. Welded Steel Wire Fabric

Plain wire fabric, as specified in Section 032100 - Concrete Reinforcement of these Specifications.

C. Reinforcing Steel Bars

As specified in Section 032100 - Concrete Reinforcement of these Specifications.

D. Dowel Bars

Smooth, ASTM A 615 + S1, Grade 60, new billet steel, coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.

E. Dowel Bar Sleeves

Sleeves, PVC or plastic, slightly larger than dowel bars, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.

F. Concrete

As specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

G. Membrane Forming Curing Compound

ASTM C 309, Type 2, unless otherwise directed.

H. Joint Materials

1. Preformed Expansion Joint Filler: ASTM D 1751, ASTM D 1752, and D 1565.
2. Joint Sealing Material: See Section 321319, Concrete Pavement Joints of these Specifications.

I. Form Coating

Commercial formulation form-coating compounds that will neither bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces. Contractor shall submit sample for approval prior to use.

J. Precast Concrete Wheel Stops

Accurately formed and finished, of size and shape as indicated, reinforced and anchored as required. Fabricate wheel stops on Site or substitute approved precast units of like design and dimensions.

K. Epoxy Bonding Grout

ASTM C 881, Type I.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Prepared subgrade shall be proof rolled to check for unstable areas and need for additional compaction. Do not begin paving work until such deficiencies have been corrected and subgrade is ready to receive paving.
- B. Loose material shall be removed from the compacted subgrade immediately prior to placing concrete and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

- A. Forms shall be set in accordance with the recommendations of ACI 316 R, Chapter 5, and as specified herein.
- B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement, and to ensure that forms shall remain in place not less than 24 hours.
- C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

- A. Joints and reinforcement shall be installed in accordance with the recommendations of ACI 316 R, Chapter 6, as specified in Section 032100 - Concrete Reinforcement of these Specifications, and in Section 321319 - Concrete Pavement Joints.
- B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

- A. Concrete shall be placed and finished in accordance with the recommendations of ACI 316 R, Chapters 10 and 12.5, and as specified in Section 32 13 73.19 - Cast-in-Place Concrete of these Specifications.

3.5 CURING AND PROTECTING CONCRETE

- A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.
- B. Protection as recommended in ACI 316 R; Chapter 11 shall be provided until written acceptance by Owner.

3.6 INSTALLATION OF CONCRETE WHEEL STOPS

- A. Install concrete wheel stops where indicated and in accordance with manufacturer's installation instructions as required. Where dowels are to be embedded into concrete, embed with epoxy bonding grout.

3.7 FIELD QUALITY CONTROL

- A. Coring

After the pavement is placed and before final acceptance the Engineer may elect to determine pavement thickness by cores cut from the pavement or direct measurement of the edge thickness. Acceptable pavement thickness shall be deficient by no more than two tenths of an inch. Core holes shall be promptly repaired with concrete conforming to the requirements specified herein by the Contractor at no cost to Owner.

B. Deficient Pavement Price Adjustments

Where the average thickness of pavement is deficient in thickness by more than 0.2 inch, but not more than 0.75-inch, payment will be made at an adjusted price as specified in the following table.

Concrete Pavement Deficiency

Deficiency in Thickness Determined by Cores Inches	Proportional Part of Contract Price Allowed
0.00 to 0.20	100 percent
Over 0.20 to 0.30	80 percent
Over 0.30 to 0.40	72 percent
Over 0.40 to 0.50	68 percent
Over 0.50 to 0.75	57 percent

Any area of pavement found deficient in thickness by more than 0.75 of an inch but not more than one inch or 1/8 of the plan thickness, whichever is greater, shall be evaluated by the Engineer. If, in the judgment of the Engineer, the area of such deficiency should not be removed and replaced, there will be no payment for the area retained. If, in the judgment of the Engineer, the area of such deficiency warrants removal, the area shall be removed and replaced, at the Contractor's entire expense, with concrete of the thickness shown on the plans. Deficient pavement shall be removed for the full area of the slab between joints, or between pre-established limits.

END OF SECTION 32 13 13

SECTION 32 13 19 - CONCRETE PAVEMENT JOINTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.
- B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.2 MEASUREMENT AND PAYMENT

- A. Unit Prices.
 - 1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.
 - 2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.
 - 3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.
 - 4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Concrete Sidewalks, and Concrete Driveways.
 - 5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).
 - 6. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

- A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

- B. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- C. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- D. ASTM D 3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.
- E. TxDOT Tex-525-C - Tests for Asphalt and Concrete Joint Sealers

1.4 SUBMITTALS

- A. Conform to requirements of Section 01330 - Submittal Procedures.
- B. Submit product data for joint sealing compound and proposed sealing equipment for approval.
- C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).

PART 2 – PRODUCTS

2.1 BOARD EXPANSION JOINT MATERIAL

- A. Filler board of selected stock. Use wood of density and type as follows:
 - 1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
 - 2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

2.2 PREFORMED EXPANSION JOINT MATERIAL

- A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

2.3 JOINT SEALING COMPOUND

- A. Conform joint sealants to one of sealant classes described in this section.
- B. Conform hot-poured rubber-asphalt compound to ASTM D 3405.
- C. Two-component Synthetic Polymer.

1. Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles.
2. Cure sufficiently at average temperature of 25 ± 1 C (77 ± 2 F) so as not to pick up under wheels of traffic in maximum three hours.
3. Performance requirements, when tested in accordance with TxDOT Tex- 525-C, shall meet above curing times and requirements as follows:

Cold-Extruded and Cold-Pourable (Self-Leveling) Specifications	
Property	Requirement
Penetration, 25 C (77 F) 150 g Cone, 5 s, 0.1 mm (in.), maximum	130
Bond and Extension 50%, -29 C (-20 F), 3 cycles: *Dry Concrete Block *Steel blocks (Primed, if recommended by manufacturer) *Steel blocks shall be used when armor joints are specified	Pass Pass
Flow at 70 C (158 F)	None
Water content % by mass, maximum	5.0
Resilience: * Original sample, % min. (cured) * Oven-aged at 70 C (158 F), % min.	50 50
Cold-extruded material only - Cold Flow (10 minutes)	None

After bond and extension test, there shall be no evidence of cracking, separation or other opening that is over 3 millimeters (1/8 inch) deep in sealer or between sealer and test blocks.

4. Provide cold-extruded type for vertical or sloping joints.
 5. Provide self-leveling type for horizontal joints.
- D. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete Joints. This shall be a single component self-leveling silicone or polyurethane material that is compatible with both asphalt and concrete pavements. The sealer shall not require a primer for bond; a backer rod shall be required which is compatible with the sealant; no reaction shall occur between rod and sealant.

When tested in accordance with TxDOT Tex-525-C, self-

leveling sealant shall meet following requirements:

Self-Leveling, Low Modulus Silicone or Polyurethane Sealant	
Property	Requirements
Tack Free Time, 25 ± 1 C (77 ± 2 F), minutes	120 maximum
Nonvolatile content, % by mass	93 minimum
Tensile Strength and 24-Hour Extension Test: * Initial, 10-day cure, 25 ± 1 C (77 ± 2 F), kPa (psi) * After Water Immersion, kPa (psi) * After Heat Aging, kPa (psi) * After Cycling, -29 C (-20 F), 50%, 3 cycles, kPa (psi) * 24 Hour Extension	* 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * Pass (All Specimens) After 24 hours, there shall be no evidence of cracking, separation or other opening that is over 3 mm (1/8 in.) deep at any point in the sealer or between the sealer and test blocks.

2.4 LOAD TRANSMISSION DEVICES

- A. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.
- B. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

2.5 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

- A. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Project Manager.

PART 3 – EXECUTION

3.1 PLACEMENT

- A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.
- B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide

straight, smooth joint surface without chipping, spalling or cracks.

3.2 CONSTRUCTION JOINTS

- A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.3 EXPANSION JOINTS

- A. Place 3/4-inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

- A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

- A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

3.6 SAWED JOINTS

- A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.
- B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.7 JOINTS FOR CURB, CURB AND GUTTER

- A. Place 3/4 inch preformed expansion joints through curb and gutters at locations of

expansion and contraction joints in pavement, at end of radius returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120- foot centers.

3.8 JOINTS FOR CONCRETE SIDEWALKS

- A. Provide 3/4-inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab.

3.9 JOINTS FOR CONCRETE DRIVEWAYS

- A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

- B. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.
- C. Use joint sealing equipment in like new working condition throughout joint sealing operation and be approved by Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.
- D. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.
- E. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

- F. Maintain joints in good condition until completion of Work.
- G. Replace damaged joints material with new material as required by this Section.

END OF SECTION 32 13 19

SECTION 32 16 13 - CONCRETE CURBS AND CURB AND GUTTER

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing, placing, curing, and protecting Portland cement concrete curbs, and combination curbs and gutters, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute
 - a. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.
2. ASTM: American Society for Testing and Materials
 - a. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (with Supplement + S1).
 - b. C 150: Specification for Portland Cement Type I or Type II.
 - c. C 309: Specification for Liquid Membrane - Forming Compounds for Curing Concrete.
 - d. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Closed Cell).
 - e. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).
 - f. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - g. D 3405: Specification for Joint Sealants, Hot-Poured, for Portland Cement Concrete Pavement.
3. FS: Federal Specifications and Standards
 - a. TT-P-86: Paint, Red-Lead-Base, Ready-Mixed.

- B. Finishing Tolerance

The top surface of curbs and combination curbs and gutters shall have a Class A tolerance as specified in ACI 316 R, Chapter 12.5.

1.3 SUBMITTALS

- A. The following Submittals shall be submitted:
1. Reinforcement Materials
 - a. As required in Section 032100 - Concrete Reinforcement of these Specifications.
 2. Concrete Materials
 - a. As required in Sections 321373.19 - Cast-in-Place Concrete of these Specifications.

1.4 EXTENDED WARRANTY

- A. Manufacturer of joint sealant shall provide at least a 1-year written warranty against material degradation and failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit LIT rights or remedies as may otherwise be afforded under law or statute.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms
- Either wood or metal, of the size and shape necessary for forming the item, straight and free of warp.
- B. Reinforcing Steel Bars
- As specified in Section 032100 - Concrete Reinforcement of these Specifications.
- C. Dowel Bars
- Smooth, ASTM A 615 + S1, Grade 60, new billet steel, unbonded ends painted with red-lead-base paint, FS TT-P-86, Type I and coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.
- D. Dowel Bar Expansion Caps
- PVC or plastic cap, slightly larger than dowel bar, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.
- E. Concrete
- As specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.
- F. Membrane Forming Curing Compound
- ASTM C 309, Type 2, unless otherwise directed.

G. Joint Materials

1. Preformed Expansion Joint Filler: Nonextruding and resilient bituminous type, ASTM D 1751.
2. Joint Sealing Material: See Section 321373 of these Specifications.

H. Form Coating

Commercial formulation form-coating compound that will not bond with, stain nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Prepared subgrade shall be inspected for unstable or unsuitable areas and need for additional compaction. Notify the Engineer in writing of such deficiencies. Do not begin curb construction until all such deficiencies have been corrected.
- B. Loose and foreign material shall be removed from the compacted subgrade immediately prior to placing concrete, and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

- A. Forms shall be set to the line and grade indicated and shall be securely staked to maintain set position during depositing and curing of concrete. The inside form shall be rigidly attached to the outside form.
- B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement and to ensure that forms shall remain in place not less than 24 hours.
- C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

- A. Reinforcement shall be installed as indicated on the Drawings and as specified in Section 032100 - Concrete Reinforcement of these Specifications. Joints shall be installed where indicated on the Drawings and in accordance with Section 321319 - Concrete Pavement Joints of these Specifications.
- B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

- A. Concrete shall be placed and finished as specified in Section 033053 - Cast-in-Place Concrete of these Specifications, and ACI 316 R, Chapters 10 and 12.5.
- B. After concrete has been struck off and has sufficiently set, the exposed surfaces shall be worked with a wood float. The exposed edges shall be rounded using an edging tool.

- C. After form removal, the surfaces of the curb or combination curb and gutter shall be plastered with a mortar consisting of one-part Portland Cement and two parts fine aggregate. Mortar shall be applied with a template constructed to the shape and dimensions of the item to be plastered. All exposed surfaces shall be brushed to a uniform smooth texture.

3.5 CURING AND PROTECTING CONCRETE

- A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.
- B. Protection as recommended in ACI 316 R; Chapter 11 shall be provided until written acceptance by the Engineer.

END OF SECTION 32 16 13

SECTION 32 80 00- IRRIGATION

PART 1.00 - GENERAL

1.01 RELATED DOCUMENTS: The Drawings, Division 0 and Division 1 apply to the work under this Section.

1.02 SCOPE:

A. Work Included:

Furnishing and installing a complete irrigation system.

Trenching and backfill.

Furnishing and installing backflow prevention devices.

Furnishing and installing sleeves for irrigation piping and remote control valves where indicated.

Installation of water meters and taps.

Inspections and tests.

B. Related Work in Other Sections:

Earthwork

Section 31 00 00

Sodding

Section 32 92 23

1.03 INTENT OF THE DRAWINGS: All piping shown on the drawings are essentially diagrammatic for installation purposes. Locations of all, valves, piping, wiring, etc., shall be established by the Contractor at the time of construction. Spacing of the sprinkler heads and quick coupling valves are shown on the drawings and shall not be exceeded.

1.04 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies:

1. All work and materials shall be in full accordance with latest rules and regulations of safety orders of Division of Industrial Safety; the Uniform Plumbing Code and other applicable laws or regulations, including the City of La Marque Plumbing Code and Section 34 of the TNRCC Texas Water Code.

2. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Contract Documents be at variance with the aforementioned rules and regulations, notify Landscape Architect and get his instructions before proceeding with the work affected.

B. Testing:

1. Preliminary review of completed installation will be made by Landscape Architect prior to backfilling of trenches and during hydrostatic testing.
2. Final review shall be made in conjunction with the final review of lawn, shrub and tree planting.

1.05 SUBMITTALS:

A. Furnish required copies of manufacturer's literature, certifications, and operating instructions for the complete list of materials, for the following items:

1. Irrigation Controller
2. Controller Grounding Plate
3. Pressure Vacuum Breaker
4. Ball Valves
5. Pipe and Fittings
6. Remote Control Valves
7. Valve Boxes
8. Rain, Freeze, and Flow Sensors
9. Spray Body & Nozzles
10. Drip Tubing / Drip Headers / Flush Valve / Air Relief Valve
11. Control Wires

B. Substitutions:

1. Specific reference to manufacturers' names and products specified in this Section are used as standards, but this implies no right to substitute other material or methods without written approval of the Landscape Architect.
2. Installation of any approved substitution is Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of Landscape Architect and without additional cost to the owner.

3. Approval by Landscape Architect of substituted equipment and/or dimensional drawings does not waive these requirements.
- C. Record Irrigation Drawings: Contractor shall furnish Record Drawings of the complete irrigation system in accordance with the General and Special Conditions. Procure from the Landscape Architect full-sized sepias of Contract Drawings. Construction drawings shall be on the construction site at all times while the irrigation system is being installed. Contractor shall make a daily record of all work installed during each day. Actual location of valves and quick couplers and all irrigation and drainage piping shall be shown on the prints by dimensions from easily identified permanent features, such as buildings, curbs, fences, walks or property lines. Drawings shall show approved substitutions, if any, of material including manufacturer's name, and catalogue number. The drawings shall be to scale and all indications shall be neat. All information noted on the print shall be transferred to the sepia by Contractor and all indications shall be recorded in a neat, orderly way. The record sepia shall be turned over to the Landscape Architect at or before the Final Acceptance of the project.

1.06 JOB CONDITIONS:

- A. Contractor shall acquaint himself with all site conditions. Should utilities or other work not shown on the plans be found during excavations, Contractor shall promptly notify Landscape Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.
- B. Contractor shall take necessary precautions to protect site conditions. Should damage be incurred, this Contractor shall repair damage to its original condition or furnish and install equal replacement at his expense.

1.07 FINAL ACCEPTANCE: Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work. Upon Final Acceptance, owner will assume responsibility for maintenance of the work. Said assumption does not relieve Contractor of obligations under Warranty.

1.08 WARRANTY:

- A. In addition to manufacturer's warranty's or warranties, Contractor shall warrant all work for one year from the date of Final Acceptance against defects in material, equipment and workmanship. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the owner.

- B. Contractor shall not be held responsible for failures due to neglect by the city, vandalism, etc., during Warranty Period. Report such conditions to Landscape Architect in writing.
- 1.09 CLEAN UP: Keep all areas of work clean, neat, and orderly at all times. Keep all paved areas clean during installation operations.

PART 2.00 - MATERIALS

- 2.01 MATERIALS: Materials throughout the new system shall be as specified and/or noted on the Drawings, new and in perfect condition.
- 2.02 WATER METER: Shall be provided and installed by the local water district in accordance with their requirements.
- 2.03 PRESSURE VACUUM BREAKER (PVB) BACKFLOW PREVENTER:
- A. Assembly to be Febco 765 and shall be provided and installed by the contractor to meet the City of La Marque requirements in accordance with TCEQ regulations.
 - B. To be as shown on Drawings and per standards of the City of La Marque.
- 2.04 PIPE:
- A. Piping on pressure side of irrigation control valves:
 - 1. Two and one-half (2 1/2") inch and smaller - To be polyvinyl chloride (PVC) 1120-1220, PVC Schedule 40 IPS Plastic Pipe, and shall conform to ASTM D-2241-73.
 - B. Piping on non-pressure side of irrigation control valves:
 - 1. Polyvinyl chloride (PVC) 1120-1220, SDR 21.0, Class 200, and shall conform to ASTM D-2241-73.
 - C. Identification: All piping shall be continuously and permanently marked with the following:
 - 1. Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (N.S.F.) approval.
- 2.05 FITTINGS:
- A. Fittings for Solvent-Welded Pipe:

1. Schedule 40, polyvinyl chloride, standard weight, as manufactured by "Sloane", "Lasco", or approved equal, to meet ASTM D-2466-73 and D-2467-73.
 2. Threaded PVC nipples - Schedule 80 PVC.
- 2.06 SLEEVE FOR CONTROL WIRE AND WATER LINE: PVC 1126-1220, Schedule 40 PVC pipe.
- 2.07 REMOTE CONTROL VALVES:
- A. Valve to be of size and manufacturer shown on drawings, slow acting valves.
 - B. Thread schedule 80 PVC nipples to intake and discharge sides of valve.
 - C. Rain Bird PEB 1" – For Rotors / Tree Bubblers.
 - D. Rain Bird XCZ-100-PRB-COM 1" For Drip.
- 2.08 AUTOMATIC CONTROLLER
- A. Rain Bird LXME2 Pro Controller. Traditionally wired, plastic wall mount with 19 station capacity.
- 2.09 CONTROL WIRE:
- A. Wire: Solid copper wire, U.L. approved for direct underground burial: 14 AWG UF.
 - B. Splicing Materials: Use only 3M DBR/Y splice kits for all electrical wiring connections.
- 2.10 FLOW SENSOR
- A. 1" ultrasonic flow sensor: Rain Bird UFS 100.
 - B. Use underground communication cable (shielded & armored) Paige P7162D-A. Install to connect flow sensor to controller.
- 2.11 VALVE BOXES: To be injection-moulded of Polyesters and fibrous inorganic temperature resistant components. Box shall provide adequate clearance to operate and service valve. Box and lid to be black, as manufactured by "Ametek", "Christy", "Carson", or equal.
- A. For Remote Control Valve: Shall be circular, approximately ten (10") inches inside diameter by ten (10") inches deep.

- B. For Ball and Quick Coupler Valves: Shall be round, approximately ten (10") inches inside diameter by ten (10") inches deep.

2.12 SAND BACKFILL: Sand for backfill shall be clean masonry sand free of stones or debris.

2.13 DRIP SYSTEM:

- A. Valve - Rain Bird X CZ-100-PRB-COM.
- B. Drip Tubing - For turf install Rain Bird XFS-CV-06-12. For shrub beds install Rain Bird XFS-CV-06-18.

2.14 ROTOR POP-UP SPRINKLER

- A. Rain Bird 3504-SAM (with check valve).
 - 1. Nozzle sizes: 0.75, 1, 1.5, 2, 3 & 4.

2.15 POP UP SPRAY HEAD

- A. Rain Bird 1806-SAM-PRS (Pressure regulating heads with check valve).
 - 1. Nozzle sizes: 8, 10, 12 & 15 in Quarter, Half, Full & VAN variations.

2.16 TREE BUBBLERS

- A. Rain Bird 1400 Flood Pressure Compensating Bubbler (1 GPM).

2.17 AUTOMATIC DRAIN

- A. King Drain or approved equal.

2.18 AUTOMATIC RAIN/FREEZE SHUT OFF DEVICE

- A. Rain Bird wireless rain and freeze sensor: WR2-RFC.

PART 3.00 - EXECUTION

3.01 LAYOUT:

- A. No consideration will be given to any design changes until after the awarding of the contract. Should any changes be deemed necessary after award of contract, for proper installation and operation of the new and existing system, such changes shall be negotiated by the Landscape Architect (and based upon the Unit Price Schedule where applicable).

- B. Layout work as accurately as possible to drawings. Drawings are diagrammatic to the extent that swing joints, wiring, flex pipe, drip indicator heads, junction box, grounding rods, and all fittings are not shown.
- C. Full and complete coverage is required. Contractor shall make any necessary minor adjustments to layout required to achieve full coverage of irrigated areas at no additional cost to the owner.
- D. Where connections to existing stubouts are required, make necessary adjustments should stubs be located differently in the Drawings. Adjust layout as necessary to install around existing work.
- E. Where piping is shown to be under paved areas but running parallel and adjacent to planted area, the intent is to install piping in planted areas. Do not install directly over another line in same trench.
- F. The Contractor will stake out the location of each run of pipe and all sprinkler heads of sprinkler valve locations prior to trenching. Before installation is started in a given area, the Landscape Architect shall check all locations and give his approval.

3.02 EXCAVATING AND TRENCHING:

- A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations, to their original condition.
- B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify Landscape Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the Record (As-Built) Drawings promptly.
- C. Dig trenches wide enough to allow a minimum of four (4") inches between parallel pipe lines. Trenches shall be of sufficient depth to provide minimum cover from finish grade as follows:
 - 1. Over pipe on pressure side of irrigation control valve, control wires and quick coupling valves: (18) inches.
 - 2. Over pipe on non-pressure side of irrigation control valve: (12) inches.
 - 3. Where system is installed over structure, lay pipe on top of soil separator. Protect soil separator with two (2") inch layer of specified planting soil mix or sand.

4. All PVC sleeves under paving shall be bedded with minimum of four (4") inches of sand backfill on all sides and have twenty four (24") inch cover.
5. All main lines shall have drain valves where applicable.
6. Backfill all pressurized mains and marker boxes with a minimum of four (4") inches of sand backfill on all sides to protect lines and boxes from expansion and contraction.

3.03 BORING UNDER EXISTING PAVEMENTS:

- A. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation shall be as described under "Excavating and Trenching". The location of the pit shall not interfere with existing plant materials or structures designated to remain.
- B. Holes shall be bored mechanically. Where holes required are larger than two (2") inches, the bore shall be completed using a pilot hole. The two (2") inch hole shall be bored the entire length of the crossing and shall be checked on the opposite end for line and grade. If acceptable, this hole shall serve as the centerline for the larger hole to be bored. Lateral and vertical tolerance is limited to one (1") inch in ten (10') feet, provided that the variation be regular and occur only in one direction.
- C. The use of water or other fluids in connection with the boring operation will be permitted only to lubricate cutting. Jetting or missiling shall not be permitted. (In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least ten (10%) percent of high-grade processed bentonite may be used to consolidate cuttings, seal the hole walls and furnish lubrication for subsequent removal of cuttings and installation of the pipe.)
- D. Excavated material will be placed near the top of the working pit and disposed of as required.
- E. Refer to other authorities for jurisdiction over other installations.

3.04 WATER METER(S): Install as per the requirements of the local water district and local codes.

3.05 BACKFLOW PREVENTION DEVICE: Install according to local codes and manufacturer's latest printed instructions.

3.06 CONDUITS AND SLEEVES:

- A. Furnish and install conduit where control wires pass under or through walls. Conduits to be of adequate size to accommodate retrieval for repair of wiring and shall extend twelve (12") inches beyond edge of walls.

- B. Install sleeves for all pipes passing through or under walls, walks and paving as shown on Drawings. Sleeving to be of adequate size to accommodate retrieval for repair of wiring or piping and shall extend twelve (12") inches beyond edge of paving or other construction.
- C. Coordinate conduit and sleeve installation with other trades as required.

3.07 PIPE LINE ASSEMBLY:

A. General:

- 1. Install pipes and fittings in accordance with manufacturer's latest printed instructions.
- 2. Clean all pipes and fittings of dirt, scales and moisture before assembly.
- 3. All pipe, fittings and valves, etc., shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.
- 4. All lateral connections to the mainline as well as all other connections shall be made to the side of the mainline pipe. No connections to the top of the line shall be allowed.

B. Solvent-Welded Joints for PVC Pipes:

- 1. Use solvents and methods by pipe manufacturer.
- 2. Cure joint a minimum of one hour before applying any external stress on the piping and at least twenty four (24) hours before placing the joint under water pressure.

C. Threaded Joints for Plastic Pipes:

- 1. Use Teflon tape on the threaded PVC fittings except where Marlex fittings are used.
- 2. Use strap-type friction wrench only. Do not use metal-jawed wrench.
- 3. When connection is plastic to metal, male adaptors shall be used. The male adaptor shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or equal upon approval.

D. Threaded Joints for Galvanized Steel Pipes:

- 1. Factory-made nipples shall be used wherever possible. Field-cut threads in pipes will be permitted only where absolutely necessary; when field threading, cut threads accurately on axis with sharp dies.

2. Use pipe joint compound to make threads only.

E. Joints for Polyethylene Pipes:

1. Double-clamp all connections one and one-quarter (1 1/4") inch diameter and greater.
2. Make all connections between polyethylene pipes and metal valves or pipes with threaded fittings using male adapters.
3. Polyethylene connectors shall be compression fittings.

F. Laying of Pipe:

1. Pipes shall be bedded in at least two (2") inches of finely divided material with no rocks or clods over one (1") inch diameter to provide a uniform bearing.
2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
3. Do not lay PVC pipe when there is water in the trench.
4. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
5. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
6. All plastic to plastic joints shall be solvent-weld joints or slip seal joints. Only the solvent recommended by the pipe manufacturer shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.
7. Unless waived by the Landscape Architect, the Contractor shall install bell type or approved slip joint fitting at a minimum of twenty (20') feet OC for all pressurized mains. All polyethylene pipes shall be laid on surface with 2" mulch layer.

3.08 IRRIGATION CONTROL VALVES: Install control valves in valve boxes where shown and group together where practical. Place no closer than twelve (12") inches to walk edges, buildings and walls. Valve boxes shall be flush with finish grade.

3.09 AUTOMATIC CONTROLLER:

- A. Install per local code and manufacturer's latest printed instructions.
- B. Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.

3.10 CONTROL WIRING: see section 2.09

3.11 CLOSING OF PIPE AND FLUSHING OF LINES:

- A. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- B. Thoroughly flush out all water lines before installing heads, valves and other hydrants.
- C. Test as specified.
- D. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution.

3.12 BACKFILL AND COMPACTING:

- A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of debris.
- B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum ninety five (95%) percent density under pavements, eighty five (85%) percent under planted areas.
- C. Compact trenches in areas to be planted by thoroughly flooding the backfill. Jetting process may be used in those areas.
- D. Dress off all areas to finish grades.

3.13 WARRANTY: The Contractor shall warrant all materials and workmanship for (one (1) year from Final Acceptance)

3.14 CLEAN UP: Clean up and remove all debris from the entire work area prior to Final Acceptance to satisfaction of Owner.

END OF SECTION 32 80 00

SECTION 32 90 00 - PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Includes:

1. Plant materials, installation, staking, edging, mulching, soil treatments, and maintenance operations through the one-year warranty period of all trees, shrubs, ornamental grasses, ground covers, annuals and perennials as indicated on drawings and specified herein.

B. Related work in other sections:

1. Section 31 00 00 – Earthwork
2. Section 32 80 00 – Irrigation
3. Section 32 92 23 – Sodding

1.2 SUBMITTALS

A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source being used:

1. Plant material: Prior to digging and shipment by the nursery, plant materials shall be tagged by the contractor and approved by the Landscape Architect. Plant materials may be photographed and submitted to the Landscape Architect for approval. Photographs shall contain a human scale factor for size and height reference. Acceptance of material through photographs does not preclude rejection of unsatisfactory material upon delivery. Submit original receipts or invoices and all delivery tickets for all materials to the Owner and Landscape Architect.
2. Mulch: product information.
3. Organic matter: product information and original delivery tickets or receipts.
4. Fertilizer: Product information and analysis.

B. Test Reports: Submit to the Owner and Landscape Architect, two copies each of certified test reports for:

1. Organic Matter: product information.

C. Certification

1. Phyto-sanitary certification: All plant material inspection certificates required by federal, state, or other governing authorities will accompany each shipment and be turned over to the Owner and Landscape Architect upon delivery.
2. Invoice: Original vendor's or grower's invoice for each shipment of plants, soil amendments, and mulch shall show sizes, quantities, and root treatment of plants, i.e., containerized, balled and burlapped, or bare root.

D. Construction Schedule: Upon authorization to proceed with the work, submit two copies of the Construction Schedule indicating dates for the items of work.

E. Maintenance Instructions: Submit two copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of landscape work for an entire year. Submit prior to Notice of Substantial Completion.

F. Chemicals: Submit products, rates of application, and anticipated uses of pesticides, herbicides, and fumigants.

1.3 QUALITY ASSURANCE

A. Qualifications

1. The Contractor shall be a company specializing in landscape installation.
2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last three years.

B. All materials and work shall comply with applicable sections of the following references:

1. American Association of Nurserymen, Inc., (AAN) Standard: American Standard for Nursery Stock (ANSI Z60.1-2004).
2. Hortus Third, Cornell University, 1976.
3. Fertilizers; Mixed Commercial. Federal Specification: 0-F-241D.

C. Source Quality Control

1. Certification: All landscape materials shall be from stock inspected and certified by authorized governmental agencies. The stock shall comply

with governmental regulations prevailing at the supply source and the job site.

2. Analysis and standards: Products packaged in sealed containers shall be labeled with manufacturer's certified analysis. The composition of bulk materials shall be tested by an approved laboratory in accordance with procedures established by the Association of Official Agricultural Chemists, wherever applicable, or as specified by product specifications referenced herein.
3. Plant material selection (containerized and B&B): Prior to digging and shipment by the nursery, the contractor shall select and pre-tag approved trees before delivery to the site. Plant materials may be photographed and submitted to the Landscape Architect for approval. Photographs shall contain a human scale factor for size and height reference. Acceptance of material through photographs does not preclude rejection of unsatisfactory material upon delivery. The contractor shall cover all expenses for the selection and pre-tag of trees and other plant materials. Notify the Landscape Architect of tagged material locations or provide photographed and tagged materials at least four weeks prior to digging.

D. Substitutions

1. If specified landscape material is not obtainable, notify the Landscape Architect, who will identify alternate sources or substitutes. Adjustments will be made at no additional cost to the Owner. If replacements are downsized, credits to the Owner will be based on comparable cost differential customary for materials and sizes involved.
2. Plants shall be supplied at the sizes specified. Plants of larger size may be used if acceptable to Landscape Architect and if sizes of roots or balls are increased proportionately.
3. Container plants may be substituted for those designed "B&B" if approved by the Landscape Architect. However, B&B substitutions will not be considered after April 15th.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Digging Plant Material

1. Plants shall not be dug at the nursery or approved source until the Landscape Architect has received (See Section 1.3, C, 3) and approved the plant material and the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

B. Transportation of Plant Material

1. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent overheating of the plants.
2. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.
3. The roots of barefoot stock shall be protected from drying out with wet straw or other suitable material while in transit.
4. Unless otherwise authorized by the Owner or Landscape Architect, notify the Landscape Architect at least five working days in advance of the anticipated delivery date of any plant material. The original bill of loading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Owner and Landscape Architect.

C. Storage

1. Unless specific authorization is obtained from the Landscape Architect, plants shall not remain on the site of work longer than three days prior to being planted.
2. Plants that are not planted immediately shall be protected as follows:
 - a. Root balls shall be kept moist and their solidity carefully preserved.
 - b. Plants shall not be allowed to dry out or freeze.
3. Both the duration and method of storage of plant materials shall be subject to the approval of the Landscape Architect.

D. Handling of Plant Materials

1. Exercise care in handling plant materials to avoid damage or stress.

1.5 REJECTION OF MATERIALS

- A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.
- B. Upon arrival at the temporary storage location or site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large

branches be broken, balls of earth broken or loosened, or areas of bark be torn or damaged the Landscape Architect will reject the injured plant.

- C. When a plant has been rejected, remove it from the area of the work and replace it with one of the required size and quality.

1.6 SUBSTANTIAL COMPLETION ACCEPTANCE

- A. The Owner and Landscape Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance of plant material by the Owner and Landscape Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents. Plants shall be healthy, free of pests and disease, and in flourishing condition before Substantial Completion acceptance shall be given. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.
- C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Owner and Landscape Architect, the Landscape Architect will recommend to the Owner that acceptance of the work of this Section be given.
- D. Acceptance in Part
1. The work may be accepted in parts when it is determined to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.
 2. Acceptance and use of such areas by the Owner shall not waive any other provisions of the Contract.

1.7 MAINTENANCE

- A. Maintain plant material until the completion of the warranty period and Final Acceptance of work, as described in Part 3 of this section.

1.8 WARRANTY

- A. Plants shall be warranted for a period of one year after the date of written approval of Substantial Completion by the Owner.
1. When the work is accepted in parts, the warranty periods shall extend from each of the partial acceptances to the terminal date of the last warranty period. Thus, all warranty periods terminate at one time.

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- B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the warranty period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.
 - C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Owner and/or Landscape Architect during and at the end of the warranty period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
 - 1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.
 - 2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
 - 3. The warranty of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended warranty period, the Owner may elect one more replacement or credit for each item.
 - D. At the end of the warranty period, and no less than five days prior to Final Inspection, staking, guying materials and tree ties shall be removed from the site or as directed by the Landscape Architect.

1.9 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the one year warranty period, the Owner and Landscape Architect will, upon written notice of end of warranty period, inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.
- B. Upon completion and re-inspection of full repairs or replacements necessary in the judgment of the Owner and Landscape Architect at that time, the Landscape Architect will recommend to the Owner that Final Acceptance of the Work of the Section be given.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plant Materials

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1. Name and Variety: Provide plant materials true to name and variety described in "Hortus Third," Cornell University, 1976, or by cultivars generally accepted in the trade.
 2. All plant material shall be No. 1 grade nursery stock grown in accordance with good horticultural practices. Plants shall be free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. They shall be sound, healthy, and vigorous, of uniform growth, typical of the species and variety, well formed, free from irregularities, with the minimum quality conforming to American Standard for Nursery Stock.
 3. Plants indicated, as specimen shall be exceptionally heavy, symmetrical, and tightly knit, cultured, to be unquestionably superior in form, branching, compactness, and symmetry.
 4. The minimum acceptable sizes of all plants shall be measured before pruning and with branches in normal position. Unless otherwise designated on the plant list, all plant dimensions shall conform to those listed in ANSI Z60.1, American Standard for Nursery Stock.
 5. Branching point is the distance above ground where balanced branching occurs or where a dimension in trunk appears to form the head of the tree.
 6. Root Treatment: Root treatments on all plants shall conform to the requirements of ANSI Z60.1. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future development after planting. B&B Trees shall not be accepted between months of May 1st to October 1st. due to Texas drought and heat conditions.
 - a. Balled and burlapped ("B&B") plants shall have a firm, natural ball of earth of sufficient diameter and depth to encompass the fibrous and feeding root systems necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord or a wire basket. Ball sizes shall meet the requirements of the ANSI Z60.1, or as indicated on the Drawings.
 - b. Plants furnished in containers shall have the roots well established in the soil mass and shall have growth in the container for at least one growing season. Containers shall be large enough to provide earth-root mass of adequate size to support the plant tops being grown. For container-grown trees, container size shall provide a minimum of 9 inches of root mass per caliper inch of trunk. Plants, other than ground covers, over-established in the container, as evidenced by pot-bound root ends, will not be accepted.

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7. Plant materials shall be subject to final approval by the Landscape Architect at the job site.
- B. Soil Amendments – (Delivery tickets shall be provided by contractor for measuring of quantities.)
1. Organic matter shall be “fully decomposed,” supplied by Living Earth Technology 713-581-3290.
 2. Sand shall be clean, coarse, ungraded, meeting the requirements of ASTM C33 for fine aggregates.
 3. Superphosphate shall be composed of finely ground phosphate rock, as commonly used for agricultural purposes, containing not less than 15 percent available phosphoric acid.
 4. Fertilizer shall be granular fertilizer containing natural ingredients such as, but not limited to, composted manures, leather tankage and/or various meals, with a minimum percentage by weight of 3-1-2 nitrogen, available phosphoric acid, and potash. The following products are approved:
 - a. GreenSense by Ideal Technologies, Inc., Irving, Texas.
 - b. SUSTANE by Sustane Corporation, Chaska, Minnesota.
 - c. Texas - Tee by Maestro-Gro.
 5. Elemental sulphur shall be finely ground horticultural grade material containing at least 95 percent purity. Material shall be delivered in unopened containers containing manufacturer's warranty analysis.
- C. Bark Mulch
1. Mulch material shall be finely shredded, fibrous hardwood bark mulch, free from other foreign material and partially decomposed, passing a 1 1/2 inch screen and free of growth or germination inhibiting ingredients supplied by Living Earth Technology. 713-581-3290.
- D. Filter fabric shall be DeWitt Pro5, or approved equal.
- E. Staking and Guying Materials
1. Tree support stakes shall be lodgepole pine or steel T- posts 8 feet in length, green.

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2. Wire stays for tree supports shall be pliable, No. 12 to 14 gauge galvanized wire.
 3. Hose for chafing guards shall be new or used two-ply fiber-reinforced garden hose of not less than 1/2 inch inside diameter. Factory seconds and rejects are acceptable. Use one color throughout job.
 4. Cable for guying trees shall be 3/16 inch diameter, 7 strand, and cadmium-plated steel.
 5. Cable clamps and turnbuckles shall be heavy galvanized, strong forged steel. Turnbuckles shall be 3/8 inch eye with 6-inch opening.
 6. Flags for marking guys shall be 18-inch sections of white 1-inch diameter PVC pipe.
 7. Earth anchor kits may replace guying materials above as approved by the Owner and Landscape Architect. Earth anchors shall be cast alloy conforming to ASTM B26-72 with 1/8 inch x 7 x 7 galvanized high strength cable tag line. Holding power in normal soil shall be a minimum 1,100 pounds. Anchor shall be Duckbill Model 68 by Foresight Industries or approved equal.
- F. Tree Wrap: Not Allowed. Damaged or injured trees will be rejected.
- G. Tree Paint: Tree paint shall be waterproof, asphalt base paint with antiseptic properties for use on existing tree wounds only and shall be TREE KOTE, Sherwin Williams Pruning Compound, or approved equal. Damaged or injured new trees will be rejected.
- H. Herbicide and soil fumigant products and rates of application shall conform to registered uses.

All sides are made watertight with durable 1/4" thick heat seals.

The bag is secured to the tree with heavy-duty nylon zippers on sewn on to each side.

Drip holes are cored through both ply of material to allow for adjustable drip times.

2.2 SOIL MIXES - (Delivery tickets shall be provided by contractor for measuring of quantities.)

- A. Tree pit-planting mix:

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1. Tree pit back fill shall be 100% existing, native soil. Rock will not be considered native, backfill soil and should be substituted with approved planting mix.
 - B. Shrub, ground cover and seasonal color beds shall have a 4" layer of enriched compost comprised of organic matter and sand tilled into the entire planting bed. Depth of bed as detailed in plans. Screened for maximum 1" particle size and blended for a uniform mixture, containing a minimum 45% organic material, supplied by Living Earth Technology, 713-581-3290.

2.3 ANTIDESICCANT

- A. Antidesiccant shall be an emulsion specifically manufactured for plant protection, which provides a protective film over plant surfaces, which is permeable enough to permit transpiration. Antidesiccant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use.
- B. Antidesiccant shall be equal to the following:

<u>Product</u>	<u>Manufacturer</u>
Wilt-Pruf	Wilt-Pruf Products, Inc. P.O. Box 4280 Greenwich, CT 06830

2.4 FUNGICIDE

- A. Fungicide shall be "Bordeaux Mix," manufactured by Hi-Yield or approved equal.

2.5 EDGING

- A. Steel edging shall be Col-Met Commercial Grade Edging, manufactured by Col-Met, Garland, TX 75042, (972) 494-3900 or (800) 829-8225 or an approved equal. Steel edging shall be shop fabricated, 3/16 in. thick x 4 or 6 in. deep, galvanized steel, primed, and painted green. Edging shall be furnished in 20 ft. lengths.
 1. Steel edging shall have slotted holes for staking steel edging every 30 in. o.c.
 2. Steel stakes shall be 16 in. long, tapered.
- B. V cut trench edge as detailed.

2.6 RIVER ROCK AND BOULDERS

- A. Small River Rock shall vary in size from 1" to 3" rock lengths.
- B. Large River Rock shall vary in size from 3" to 6" rock lengths.
- C. Moss Boulders shall be generally dark brown to rustic in color as to contrast with the river rock. Size, shape and installation method of the boulders shall be as indicated in the detail drawings.

PART 3 - EXECUTION

3.1 VEGETATION REMOVAL

- A. Strip existing aggregates, granites, edging, plant material, grass and weeds, including roots, from all bed areas, leaving the soil surface one inch below finished grade.
- B. Herbicides: Apply specific herbicide to eradicate vegetation within bed areas.

3.2 PLANTING

A. Excavation

- 1. Rocks and other underground obstructions shall be removed to a depth necessary to permit proper planting according to plans and specifications. If underground utilities or other structural obstructions are encountered, the Landscape Architect will determine alternate planting locations.
- 2. Plant pits shall be dug only by methods approved by the Landscape Architect.
 - a. Spread compost across the planting bed area to a 4" depth and till to depths detailed and described in the planting plans.
 - b. Planting pits shall be round, with vertical sides and flat bottoms, and sized in accordance with outlines and dimensions shown on the drawings.
 - c. If rotating augers or other mechanical diggers are used to excavate holes, the vertical sides of the pits shall be scarified, fractured, or otherwise broken down to eliminate impervious surfaces.
 - d. Loosen or scarify in the bottom of all plant pits to a depth of 4 inches.

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- e. Over excavate the tree pits to remove an additional 12 inches of impervious materials.
 3. Excavated material that is not conducive to plant growth will not be used for backfill in any planter or planting pit and shall be removed to an area designated by the Owner or Owner Representative.
 4. PERCOLATION TESTS: Dig each tree and plant pit in accordance with the required details. Fill each hole with water and wait for 24 hours. If the planting pit is absent of water after the 24 hour waiting period, planting may commence. If not, notify the Owner and Landscape Architect. Additional drainage elements may be required.

B. Planting

1. Trees: Place a compacted planting mixture in the bottom of the pit or to depth necessary to set the plant 2 inches above finished grade to insure that the root flare is not covered. Set the plant in the pit to the proper grade and position, faced to give the best appearance or relationship to one another and adjacent structures. Cut away burlap, rope, wire, or other wrapping materials from the top of the ball and remove. Do not remove burlap or ties from sides or bottom of ball. If plastic wrap or other non-degradable materials are used in lieu of burlap, completely remove them before placing of backfill. Cleanly cut off broken or frayed roots and sever the sides of the root ball of container-grown trees in several places. Slowly move away wrapping roots from the tree flare or ball and direct root away from tree. Place native soil or planting mixture (in cases of rock) around the ball and carefully compact to avoid injury to the roots and to fill the voids. After backfilling planting pit approximately two-thirds full, add water and allow planting mixture to settle. After the water has been absorbed, fill the planting pit with additional native soil or planting mixture. Tamp lightly to grade, place a 1-inch layer of organic matter over planting mixture, and form a watering basin of the size indicated on the drawings. Do not cover the tree root flare.
2. Container-grown shrubs, ground cover, and vines: Remove containers before planting and sever the sides of root ball in several places, loosening the roots on the outside of the ball sufficiently to encourage rapid root extension into the surrounding soil and to prevent girdling of root mass.

C. Mulching

1. Mulching shall take place within 48 hours after planting.

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2. Mulch plant beds, tree, and shrub planting pits to a uniform depth of 3 inches.
 3. Mulch shall be kept out of the crowns of shrubs, away from tree trunks, and off buildings, sidewalks, light standards, and other structures.
- D. Pruning
1. Trees
 - a. Prune trees by removing all dead wood, badly formed crossing limbs, and any other growth to insure healthy and symmetrical growth of new wood. Up to one-third of the branches may be removed. The proportion is, in all cases, subject to the approval of the Owner and Landscape Architect.
 - b. In the case of multiple leaders, preserve the one which will best promote the symmetry of the tree, and remove or cut back the remainder so that they will not compete with the selected leader. Cut back surrounding top branches to conform to the leader.
 - c. Paint cut surfaces over one inch in diameter with tree wound dressing.
 2. Shrubs
 - a. Prune shrubs by removing all dead wood and broken branches, thinning out canes and cutting back or removing unsymmetrical branches. Pruning shall result in a loose outline conforming to the general shape of the shrub type. Do not use hedge shears.
- E. Wrapping: Not Allowed
- F. Guying and Staking
1. Guying and staking operations shall be completed as shown on the drawing details immediately after planting.
 2. Stakes and guys shall be removed by and become the property of the Contractor at the end of the one year warranty period.
- G. Edging
1. Steel edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.

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2. Steel edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.
 3. Adjacent lengths of edging shall overlap eight inches.
 4. Edging shall be set plumb and vertical at required line and grade. Straight sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.
 5. Top of edging shall be set in 3/4 in. above finished grade.
 6. All corners shall be of 1 piece. Minimum length of short leg shall be not less than 5 ft.

H. Maintenance

1. The maintenance period shall commence when the written Notice of Substantial Completion is issued and shall continue as required until the end of the warranty period.
2. Plants shall be inspected at least once per week by the Contractor during the installation period and needed maintenance performed promptly. Monthly inspections should occur in the cool season and biweekly inspections in the warm season, during the one year warranty period.
3. The Contractor shall irrigate all plants adequately to maintain optimum supply of moisture within the root zone; recurring overly dry or wet conditions shall be grounds for rejection of plant material. If the irrigation system is inoperative, hand watering shall be accomplished from a source approved by the Owner. Water shall not be applied with a force that will displace mulch or cause soil erosion and shall not be applied so quickly that it cannot be absorbed by the mulch and plants.
4. Plants shall be pruned and mulch replaced as required.
5. Stakes and guys shall be adjusted or replaced as required. Repair eroded or damaged plant saucers.
6. Maintain all plant beds and saucers weed free at all times.
7. Keep plants free of insects and disease. All insecticides and fungicides applied to control pests and maintain plants in a healthy growing condition shall be approved by the Owner.
8. Fertilize plants at least twice during the warranty period. Fertilization shall be applied by topdressing 1 pounds per 100 square feet of bed area, and

1 to 2 pound each tree. Fertilizer for the application shall be a controlled release type used for the installation.

9. Remove, at no cost to Owner, dead and unacceptable plants, as their condition becomes apparent. A dead or unacceptable plant is defined by more than 20% of the foliage or branches are dead.

3.3 APPLICATION OF FERTILIZER

- A. Organic Fertilizer: Planting beds shall be fertilized two times per year (March and October) with Organic Fertilizer at a minimum rate of 10 lb. per 1,000 square ft. Rate of application shall be varied depending on fertilizer type used, weather conditions, and overall soil conditions to produce a consistent growth and color to the plantings. After application of fertilizer, planting beds shall be thoroughly watered.

3.4 CLEANUP AND PROTECTION

- A. Cleanup
 1. Excess and waste material shall be removed daily.
 2. When planting in an area has been completed, the area shall be cleared of all debris, soil piles, and containers.
 3. At least one paved pedestrian access route and one paved vehicular access route to each building shall be kept clean at all times. Other paving shall be cleaned when work in adjacent areas is completed.
- B. Repairs: Any damage to existing landscape, paving, or other such features because of work related to this contract shall be repaired and restored to its original condition.
- C. Protection: Protect landscape work and materials from damage due to landscape operations, operations by other Contractors, trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

END OF SECTION 32 90 00

SECTION 32 92 23 - SODDING

PART 1 - GENERAL

- 1.01 This work includes all labor, materials, and equipment for soil preparation, fertilization, planting and other requirements regarding turfgrass planting areas shown on the plans.
- 1.02 RELATED WORK SPECIFIED ELSEWHERE:
- A. Section 31 00 00 - Earthwork.
 - B. Section 32 90 00 - Planting
- 1.03 SUBMITTALS:
- A. Delivery Receipts and Invoices: All delivery receipts and copies of invoices for materials used for this work shall be subject to checking by the Owner or his representative and shall be subsequently delivered to the office of the Owner.
 - B. Samples and Producers' Specifications: Various samples, certificates, and specifications of seed, fertilizer and other materials shall be submitted for approval as required by subsequent sections of this specification.

PART 2 - PRODUCTS

- 2.01 TURFGRASS:
- A. Common Bermuda Sod: Turfgrass sod shall be *Cynodon dactylon* (Common Bermudagrass) as specified on the plans. Sod shall consist of stolons, leaf blades, rhizomes, and roots with a healthy, virile system of dense, thickly matted roots throughout the soil of the sod for a thickness not less than three-quarters ($\frac{3}{4}$ ") inch. Sod shall be alive, healthy, vigorous, free of insects, disease, stones, and undesirable foreign materials and grasses. The grass shall have been mowed prior to sod cutting so that the height of the grass shall not exceed two (2") inches. Sod shall have been produced on growing beds of loam topsoil. Sod shall not be harvested or planted when its moisture condition is so excessively wet or dry that its survival will be affected. All sod is to be harvested, delivered, and planted within a twenty-four (24) hour period of time. Sod shall be protected from exposure to wind, sun, and freezing. If sod is stacked, it shall be kept moist and shall be stacked roots-to-roots and grass-to-grass.
 - 1. Dimensions: All sod shall have been machine cut to uniform soil thickness of one (1") inch plus or minus one-quarter ($\frac{1}{4}$ ") inch. All sod shall be of the same thickness. Rectangular sections of sod may vary in length, but all shall be of equal width and of a size that permits the sod to be lifted, handled, and rolled without breaking. Broken pads and torn, uneven ends will be unacceptable.

2.02 FERTILIZER:

- A. General: Fertilizer shall be a commercial product, uniform in composition, free flowing, and suitable for application with approved equipment. Fertilizer shall be delivered to the site in fully labeled original containers. Fertilizer which has been exposed to high humidity and moisture, or has become caked or otherwise damaged making it unsuitable for use, will not be acceptable.
- B. Initial Planting Application: Fertilizer for the initial planting application shall be a starter fertilizer with a N-P-K ratio of 4-5-1 (19-26-5) or approved equal. The phosphorus component must be derived from monoammonium phosphate to stimulate vigorous development of new roots, stolons, and rhizomes. This initial application must be applied and incorporated into the soil immediately prior to sodding or sprigging and applied immediately after seedlings begin to emerge on seeded areas.
 - 1. Specification Submittal: Submit a sample label or specification of the fertilizer proposed to be used for the Owner's approval.
- C. Post Planting Application: Fertilizer for the post planting application will be a complete fertilizer of chemical base containing by weight the following percentages of nutrients: 27-3-4 +2% Fe (N-P-K) or approved equal from methylene urea or the nitrogen equivalent of 33-3-10. The application rate should provide one (1) pound of nitrogen per 1,000 square feet.
 - 1. Specification Submittal: Submit a sample label or specification of the fertilizer proposed to be used for the Owner's approval.

PART 3 - EXECUTION

3.01 GENERAL:

- A. All turf operations are to be executed across the slope, parallel to finished grade contours.

3.02 SOIL PREPARATION:

- A. Tillage: Tillage shall be accomplished to loosen the soil, destroy existing vegetation, and prepare an acceptable sod area. All areas shall be tilled with a heavy duty disc or a chisel-type breaking plow, chisels set not more than ten (10") inches apart. Initial tillage shall be done in a crossing pattern for double coverage then followed by a disc harrow. Depth of tillage shall be five (5") inches.
- B. Cleaning: Soil shall be further prepared by the removal of debris, building materials, rubbish, weeds, and stones larger than three-quarter ($\frac{3}{4}$ ") inches in diameter.

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- C. Fine Grading: After tillage and cleaning, all areas to be planted shall be leveled, fine graded, and drug with a weighted spike harrow or float drag. The required result shall be the elimination of ruts, depressions, humps, and objectionable soil clods. This shall be the final soil preparation step to be completed before the commencement of fertilizing and planting.
 - D. Rock Removal: During the soil preparation process, a "Rock Pick" or other approved piece of machinery shall be used to gather surface stones as small as three-quarter ($\frac{3}{4}$) inch in diameter. The Contractor shall be responsible for the disposal of collected materials as waste per "Clean Up," Paragraph 3.12.

3.03 FERTILIZING:

- A. Initial Planting Application: The fertilizer shall be applied at the rate of one (1) pound of phosphorus per one thousand (1000) square feet.
 - 1. Timing: The initial planting application of fertilizer for all areas shall be applied after the soil preparation, but not more than two (2) days prior to turfgrass planting.
- B. Post Planting Application: Thirty (30) days after planting, turfgrass areas shall receive the specified post planting fertilizer at the rate of one (1) pound of nitrogen per one thousand (1,000) square feet.
 - 1. Timing: The Project Coordinator and Landscape Architect will determine if it is too late in the growing season for the post planting application. In the event that it is, the application shall be made in the spring of the next year, or the cost of the application may become a credit due to the Owner.
 - 2. Post Planting Maintenance: See Paragraph 3.9. Areas without a uniform stand (complete coverage) that must be maintained later than thirty (30) days after the initial planting shall receive subsequent applications of fertilizer, as described above, every thirty (30) days until a uniform stand is achieved.

3.04 PLANTING:

- A. Solid Sodding:

1. Prior to laying the sod, the planting bed shall be raked smooth to true grade and moistened to a depth of four (4") inches, but not to the extent causing puddling. The sod shall be laid smoothly, tightly butted edge to edge, and with staggered joints. The sod shall be pressed firmly into contact with the sod bed by rolling or by hand tamping with an approved tamper so as to eliminate all air pockets, provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Following compaction, fine screened soil of good quality shall be used to fill all cracks between sods. Excess soil shall be worked into the grass with suitable equipment and shall be well watered. The quantity of fill soil shall be such that it will cause no smothering of the grass.
2. All sodded areas shall be flush with the finish grade of adjacent grassed areas.
3. All sod on slopes that exceed a 3:1 slope and all sod in drainage channels shall be held to the slope with 4" length biodegradable stakes or staples driven through the sod and into the underlying soil. Stake each piece in at least 3 places to prevent slippage. Stakes should be spaced and set in from the sod stripes edges by at least 6" – 8".

3.05 PROTECTION:

- A. No heavy equipment shall be moved over the planted turf area unless the soil is again prepared, graded, leveled, and replanted. It will be the responsibility of this Contractor to protect all paving surfaces, curbs, utilities, plant materials, and any other existing improvements from damage. Any damages shall be repaired or replaced at no cost to the Owner. This Contractor will also locate and stake all irrigation heads, valve risers, etc., prior to beginning any soil preparation work.

3.06 IRRIGATION SYSTEM:

- A. The proposed irrigation system must be complete in all respects and must be completely operational before turfgrass planting may begin. After planting, any breakdowns in the irrigation system attributable to warranty items must be immediately repaired by the Contractor. Otherwise, the cost of replacing the lost turf caused by the Contractor's failure to promptly repair the irrigation system will be fully borne by the Contractor.
- B. All turf areas not covered by the proposed irrigation systems must be irrigated with a temporary above-ground irrigation system. The above-ground temporary irrigation system shall remain in place until all non-irrigated turf areas have established an acceptable stand of turfgrass. Contractor shall be responsible for installation,

operation and removal of the temporary system. All cost associated with the temporary system shall be borne by the Contractor.

3.07 ESTABLISHMENT AND ACCEPTANCE:

- A. Regardless of unseasonable climatic conditions or other adverse conditions affecting planting operations and the growth of the turfgrass, it shall be the sole responsibility of the Contractor to establish a uniform stand of turfgrass as herein specified. When adverse conditions such as drought, cold weather, high winds, excessive precipitation, or other factors prevail to such an extent that satisfactory results are unlikely, the Owner may, at his own discretion, stop any phase of the work until conditions change to favor the establishment of turfgrass.
- B. A uniform stand with complete coverage of the specified grass shall be defined as not less than 90% coverage in a ten foot square area for seeded and sprigged areas. Growing plants shall be defined as healthy grass plants at least 1 ½" inches tall.
- C. Complete coverage in sodded areas is defined as no visible joints showing or felt between individual sections of sod.

3.08 POST-PLANTING MAINTENANCE:

- A. Maintenance shall begin immediately after each grass area is planted. All planted areas will be protected and maintained by watering, weed control, and replanting as necessary for at least thirty (30) days after initial planting and for as long as necessary to establish a UNIFORM STAND OF THE SPECIFIED GRASS and until the entire project has been accepted by the Owner. It is anticipated that a minimum of one (1) mowing will occur before the grass areas are accepted by the Owner. All areas which are not completely covered with the specified grass at the end of thirty (30) days will continue to be replanted and maintained by the Contractor until complete coverage and acceptance are achieved.
- B. Water: Apply at least one-half (½") inch of water over the entire planted area every three days. Contractor shall water thoroughly and infrequently once grass is established to encourage deep root growth.
- C. Mowing: Once grass is established the planted area shall be mowed at least once a week during the growing season. Grass shall be mowed to a height of two inches. Mowing during dormant season will be done as necessary.
- D. Weed Control: No sooner than 45 days after grass has germinated any weed growth shall be arrested over the entire planted area. Eliminate weed growth that continues to grow after the initial application. All weed growth during the dormant season will

be controlled with spot applications of "Round-Up." "Round-Up" will not be used until the grass is totally dormant.

E. Replanting: All areas that do not produce a UNIFORM STAND OF GRASS must be replanted until a UNIFORM STAND OF GRASS is established.

F. Edging: All turf areas adjacent to paved areas shall be edged to maintain a neat appearance.

3.09 GRADING:

A. All grading and placing of topsoil on any given area will be done prior to the turfgrass installation. It will be this Contractor's responsibility to maintain the existing grades and leave them in a true and even condition after planting turfgrass.

3.10 EROSION CONTROL:

A. Throughout the project and the maintenance period for turfgrass, it is the Contractor's responsibility to maintain the topsoil in place at specified grades. Topsoil and turfgrass losses due to erosion will be replaced by the Contractor until establishment and acceptance is achieved.

3.11 CLEAN UP:

A. This Contractor shall remove any excess material or debris brought onto the site or unearthed as a result of his turfgrass operations.

3.12 GUARANTEE:

A. This Contractor shall guarantee all materials used for this work to be the type, quality, and quantity specified.

END OF SECTION 32 92 23

SECTION 33 05 16 - UTILITY STRUCTURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Excavation and backfill.
- B. Cast-in place concrete structures.
- C. Precast concrete structures.
- D. Metal components.

1.2 RELATED SECTIONS

- A. Concrete formwork, concrete reinforcement, cast-in-place concrete, Portland cement concrete, concrete repair and finishing, and precast concrete are specified in the various Sections under Division 3 – Concrete and Division 33 – Exterior Improvements.
- B. Interior trench drains and gratings for interior uses are specified in Section 05 50 00 - Metal Fabrication.
- C. Duct banks are specified in Section 20 50 16 - Underground Ductwork and Structures for Facility Services.

1.3 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for utility structures will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for utility structures indicated in the Bid Schedule of the Bid Form.
- B. Lump Sum: If the Bid Schedule indicates a lump sum for utility structures, the lump-sum method of measurement and payment will be in accordance with Division 00 – Procurement and Contracting Requirements.
- C. Unit Price: If the Bid Schedule indicates a unit price for utility structures, the unit-price method of measurement and payment will be as follows:
 - 1. Measurement:
 - a. Cast-in-place concrete and precast concrete units or structures and metal curb-and-gutter inlets will be measured for payment by the individual unit (each), installed in place. Each different type and size of concrete unit or structure will be measured separately for payment.
 - b. Manhole covers and frames, grates and frames, pipe inlets and outlets, manhole steps, ladders, miscellaneous metal, reinforcing steel, and grounding will not be measured separately for payment, but will be included as part of the utility structure to which it is attached or embedded.

- c. Excavation and backfill for utility structures will be measured separately for payment as specified in Section 31 00 00 - Earthwork, as applicable.
- 2. Payment:
 - a. Utility structures will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1, herein.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A36/A36M Specification for Structural Steel
2. ASTM A48 Specification for Gray Iron Castings
3. ASTM A108 Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
4. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A536 Specifications for Ductile Iron Castings
7. ASTM B3 Specification for Soft or Annealed Copper Wire
8. ASTM B26/B26M Specification for Aluminum-Alloy Sand Castings
9. ASTM C33 Specification for Concrete Aggregates
10. ASTM C150 Specification for Portland Cement
11. ASTM C260 Specification for Air-Entraining Admixtures for Concrete
12. ASTM C270 Specification for Mortar for Unit Masonry
13. ASTM C478 Specification for Precast Reinforced Concrete Manhole Sections
14. ASTM C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
15. ASTM C789 Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
16. ASTM C850 Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 feet of Cover Subjected to Highway Loadings

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- 17. ASTM C858 Specification for Underground Precast Concrete Utility Structures
 - 18. ASTM C891 Practice for Installation of Underground Precast Concrete Utility Structures

B. Underwriters Laboratories Inc. (UL):

- 1. UL 467 Grounding and Bonding Equipment

1.5 SUBMITTALS

- A. General: Refer to Division 00 – Procurement and Contracting Requirements for submittal requirements and procedures.
- B. Shop Drawings: When not indicated on the Contract Drawings in sufficient detail or definition, submit detailed drawings of cast-in-place and precast concrete utility structures and related metal work.
- C. Product Data: Submit manufacturers' product data for standard manufactured precast concrete utility boxes and structures and for metal gratings and covers and other, related miscellaneous metal items.
- D. Certification: Submit certification or other acceptable evidence that covers and grates to be provided for roadways and parking areas meet proof-testing requirements for H2O and HS2O loadings in accordance with Caltrans Bridge Design Specifications Manual, Section 3.

PART 2 – PRODUCTS

2.1 CAST-IN-PLACE CONCRETE STRUCTURES

- A. Materials: Comply with requirements of Section 03 05 15 - Portland Cement Concrete, except as specified otherwise herein.
 - 1. Portland Cement: ASTM C150, Type II, low alkali.
 - 2. Cementitious Admixture: Provide fly ash or pozzolan conforming with ASTM C618, Class F or N, not to exceed 15 percent by weight of the cement content.
 - 3. Aggregates: ASTM C33, fine aggregate and Size Nos. 56 or 57 (1-inch maximum size) coarse aggregate.
- B. Mix Design: Obtain design of concrete mix as specified in Section 03 05 15 - Portland Cement Concrete, and incorporate the following requirements:
 - 1. Concrete Strength: Class 4000 minimum in accordance with Table 03305-A of Section 03 05 15 - Portland Cement Concrete, except that electrical structures, such as vaults, pull boxes, and concrete for ductbanks, shall be Class 3000.
 - 2. Maximum water-cement plus pozzolan ratio: 0.45.
 - 3. Maximum slump: 4 inches.

2.2 PRECAST CONCRETE STRUCTURES

- A. General: The Contractor may provide precast concrete structures that conform to the general configuration, capacities, and inverts indicated.
- B. Fabrication Standards: Comply with requirements of Section 03 40 00 - Precast Concrete, and ASTM C478, ASTM C789, ASTM C850, and ASTM C858, as applicable, and applicable manufacturers' standards.
- C. Materials: Comply with requirements of Section 03 20 00 - Concrete Reinforcing, Section 03 05 15 - Portland Cement Concrete, and Section 03 40 00 - Precast Concrete, except as specified otherwise herein. Provide fine and coarse aggregates conforming to ASTM C33, in size commensurate with structure and reinforcement clearances.
- D. Portland Cement Concrete: Class 4000 minimum in accordance with Table 03305-A of Section 03 05 15 - Portland Cement Concrete. Concrete may be polymer or latex modified to achieve higher strengths and denser concrete. Concrete shall not deteriorate from chemical attack of sanitary waste.
 - 1. Concrete for electrical utility structures shall be Class 3000.
- E. Precast Covers: Precast covers shall have the utility identification, such as "PG&E Gas Valve," stamped into the cover.
- F. Quality Control: In accordance with Section 01 45 00 - Quality Control, the Contractor shall perform such inspections and tests as required to verify compliance with these Specifications.

2.3 METAL COVERS, GRATES, AND INLETS

- A. Ferrous Castings:
 - 1. Metal used in manufacture of castings shall conform to ASTM A48, Class 35B for Gray Iron, or ASTM A536, Grade 65-45-12 for Ductile Iron.
 - 2. Castings shall be of uniform quality, free from blowholes, shrinkage, distortion or other defects. Castings shall be smooth and cleaned by shotblasting.
 - 3. Minimum tensile strength shall be 35,000 psi.
 - 4. Castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Round frames and covers shall have continuously machined bearing surfaces to prevent rocking and rattling.
 - 5. Where castings will be subjected to loads of H₂O or greater, as indicated, provide ductile iron castings.
- B. Aluminum Castings: Where required to reduce weights of larger covers for ease of handling, such covers may be manufactured of aluminum castings conforming to ASTM B26/B26M, Alloy No. 713.0. Minimum tensile strength shall be 32,000 psi.
- C. Manhole Covers: Provide cast, manufactured manhole covers and frames with heavy-duty solid cover (lid) or vented cover (lid) as indicated. Covers shall be embossed or engraved with nonslip

diamond or square cross-hatched pattern. Provide covers with embossed or engraved word identification, as indicated or appropriate, for the enclosed or underground utility.

D. Grates:

1. Cast Ferrous Grates: Grates for area drains and catch basins shall be heavy-duty, bicycle safe inlet grates and frames of size and configuration indicated. Grates in roadways and parking areas shall withstand H20 loadings when proof-tested in accordance with Caltrans Bridge Design Specifications Manual, Section 3.
2. Bar-Type Steel Grates: Refer to Section 05 50 00 - Metal Fabrications, for requirements. Bar-type steel gratings will be permitted only in areas where vehicular traffic will not be encountered.

E. Curb and Gutter Inlets: Provide cast, manufactured curb inlet frame, grate, and curb box of size and configuration indicated. Curb and gutter inlets shall conform to the contour and profile of the concrete curb and gutter. Grates shall be heavy-duty and bicycle-safe and shall withstand H20.

F. Cast Iron Manhole Steps: Provide cast, manufactured manhole steps with cross-hatched treads and with anchor configuration appropriate for cast-in-place concrete or precast concrete as indicated. Provide steps for installation 12 inches on center in vertical alignment.

2.4 MISCELLANEOUS METAL

A. Requirements: Provide channel inserts, pulling eyes, ladders, and electrical grounding rods for electrical manholes and pull boxes as indicated.

B. Steel Materials: Standard structural sections, shapes, plates, bars, and rods, as indicated, conforming with ASTM A36/A36M. Bars conforming with ASTM 108 will be acceptable.

C. Anchors and Bolts: Conform with requirements of Section 05 50 00 - Metal Fabrications, as applicable. Bolts and studs, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A153.

D. Ladders: Provide standard-manufactured or custom-fabricated steel ladders as required to meet the conditions indicated. Steel ladders shall be hot-dip galvanized after fabrication.

E. Grounding and Bonding Materials: Conform with UL 467 and the following requirements:

1. Grounding Rods: Medium carbon steel core, copper-clad by the molten weld casting process, 3/4-inch diameter by 10 feet long in size.
2. Bare Conductors: ASTM B3, No. 1/0 AWG, Class B stranded, annealed copper conductor.

F. Fabrication: Form and fabricate the work as indicated. Include anchors, fasteners, and accessories to anchor and secure the work in place.

G. Galvanizing: All ferrous metal items shall be galvanized after fabrication by the hot-dip process in accordance with ASTM A123. Weight of the zinc coating shall conform with the requirements specified under "Weight of Coating" in ASTM A123.

2.5 MORTAR

- A. Cement mortar for the sealing of openings for pipe penetrations, for cementing of joints of component parts of precast structures, for providing of flow characteristics for the bottoms of drainage structures, and other features as indicated shall conform with the Texas Building Code, Chapter 21, Type S (without lime), with a minimum compressive strength at 28 days of 1,800 psi.
- B. Mortar shall comply with applicable requirements of ASTM C270, including measurement, mixing, proportioning, and water retention. Ten percent by volume of the cement content of the mortar shall be fly ash or pozzolanic material conforming with ASTM C618.
- C. Use mortar within 90 minutes after mixing. Discard mortar that has been mixed longer or that has begun to set. Re-tempering of mortar will not be permitted.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Requirements: Construct manholes, junction chambers, catch basins, curb and gutter inlets, trench drains, culverts, headwalls, wingwalls, pull boxes, utility boxes and vaults, and related utility structures in connection with the installation of pipe, conduits, ductbanks, and utility trenches, as indicated.
- B. Excavation and Backfill: Provide excavation, prepared subgrade and aggregate base, and backfill as specified in Section 31 00 00 – Earthwork and Section 33 05 28 - Trenching and Backfilling for Utilities, as indicated.
- C. Cast-in-Place Concrete Structures: Provide formwork, steel reinforcement, and concrete in accordance with applicable requirements of Section 03 20 00 - Concrete Reinforcing, and Section 03 30 00 - Cast-In-Place Concrete.
- D. Precast Concrete Structures: Install as indicated. Comply with applicable requirements of ASTM C891. Provide such appurtenances and installation accessories, including cement mortar and sealants, as required for a complete installation.
- E. Metal Components: Install manhole covers, grates and frames, curb and gutter inlets, metal steps, ladders, channel inserts, pulling eyes, and electrical grounding rods as indicated and in accordance with the respective manufacturer's instructions. Covers and grates in roadways, parking areas, and concrete walks shall be installed flush with adjacent, abutting pavement.

3.2 FIELD QUALITY CONTROL

- A. The Contractor shall perform slump tests and strength tests of cast-in-place structures in accordance with the requirements specified in Section 32 13 13 - Portland Cement Concrete Paving.
- B. Acceptance of cast-in-place structures will be in accordance with Section 03-30-00, Cast-in-Place Concrete.

END OF SECTION 33 05 16

SECTION 33 05 28 - TRENCHING AND BACKFILLING FOR UTILITIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

1.2 MEASUREMENT AND PAYMENT

- A. Unit Prices
 - 1. No additional payment will be made for trench excavation, embedment and backfill under this Section. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.
 - 2. When Project Manager directs Contractor to over excavate trench bottom, Contractor will be paid by unit price bid per linear foot under bid item - 6-inches Over Excavation of Trench Bottom.
 - a. No payment will be paid if Project Manager does not direct Contractor to over excavate trench bottom.
 - b. No over excavation will be measured or paid when unsuitable conditions result from dewatering system not in conformance with Section 01578 - Control of Ground and Surface Water.
 - 3. No additional payment will be made for performing Critical Location exploratory excavation. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.
 - 4. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price

1.3 DEFINITIONS

- A. Pipe Foundation: Suitable and stable native soils that are exposed at trench subgrade after excavation to depth of bottom of bedding as shown on Drawings, or foundation backfill material placed and compacted in over-excavations.
- B. Pipe Bedding: Portion of trench backfill that extends vertically from top of foundation up to level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.

- C. Haunching: Material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.
- D. Initial Backfill: Portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to level line 12-inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.
- E. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.
- F. Trench Zone: Portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.
- G. Unsuitable Material: Unsuitable soil materials are the following:
 - 1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
 - 2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
 - 3. Materials that contain large clods, aggregates, stones greater than 4-inches in any dimension, debris, vegetation, waste or any other deleterious materials.
 - 4. Materials that are contaminated with hydrocarbons or other chemical contaminants.
- H. Suitable Material: Suitable soil materials are those meeting specification requirements. Materials mixed with lime, fly ash, or cement that can be compacted to required density and meeting requirements for suitable materials may be considered suitable materials, unless otherwise indicated.
- I. Backfill: Suitable material meeting specified quality requirements placed and compacted under controlled conditions.
- J. Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01578 - Control of Ground Water and Surface Water.
- K. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally entering trench shall be controlled and removed as part of excavation drainage.
- L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using drainage layer, as defined in ASTM D 2321, placed on foundation beneath pipe bedding or thickened bedding layer of Class I material.

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- M. Trench Conditions are defined with regard to stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.
1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.
 2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.
 - a. Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.
 - b. Stable Wet Trench in Sandy Soils: Excavation drainage is provided in embedment zone in combination with ground water control in predominately sandy or silty soils.
 3. Unstable Trench: Unstable trench conditions exist in pipe embedment zone if ground water inflow or high-water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.
- N. Sub-trench: Sub-trench is special case of benched excavation. Sub-trench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of sub-trench depends upon trench stability and safety as determined by Contractor.
- O. Trench Dam: Placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along trench.
- P. Over-excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings and backfilled with foundation bedding.
- Q. Foundation Bedding: Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material separation. Foundation bedding is placed and compacted as backfill to provide stable support for bedding. Foundation bedding materials may include concrete seal slabs.
- R. Trench Safety Systems include both protective systems and shoring systems as defined in Section 02260 - Trench Safety Systems.
- S. Trench Shield (Trench Box): Portable worker safety structure moved along trench as work proceeds, used as protective system and designed to withstand forces imposed on it by cave in, thereby protecting persons within trench. Trench shields may be stacked if so designed or placed in series depending on depth and length of excavation to be protected.

- T. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movement of ground affecting adjacent installations or improvements.
- U. Special Shoring: Shoring system meeting special shoring as specified in Paragraph 1.08, Special Shoring Design Requirements, for locations identified on Drawings.
- V. Vacuum Excavation: An excavation technique performed by an experienced subcontractor in which water or air jetting is used to slough off and vacuum away soil.
- W. Large Diameter Water Line (LDWL): Water line that is 24-inches in diameter or larger. X. Emergency Action Plan (EAP): The EAP document should include a discussion of procedures for timely and reliable detection, classification (level of emergency) and response procedure to a potential emergency condition associated with a large diameter water line.
- Y. Subsurface Utility Exploration (SUE): Non-destructive excavation, unless otherwise approved by project manager.

1.4 REFERENCES

- A. ASTM A 798 – Standard Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications.
- B. ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipelines.
- C. ASTM C 891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures
- D. ASTM C 1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
- E. ASTM C 1675 - Standard Practice for Installation of Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
- F. ASTM C 1821 - Standard Practice for Installation of Underground Circular Precast Concrete Manhole Structures
- G. ASTM D 558 - Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures.
- H. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
- I. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
- J. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- K. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classifications System).

- L. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- M. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- N. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- O. TxDOT Tex-101-E - Preparing Soil and Flexible Base Materials for Testing.
- P. TxDOT Tex-110-E - Particle Size Analysis of Soils.
- Q. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

1.5 SCHEDULING

- A. Schedule work so that pipe embedment can be completed on same day that acceptable foundation has been achieved for each section of pipe installation, manhole, or other structures.
- B. For proposed utility adjacent to or across existing LDWL:
 - 1. Conduct a meeting between contractor, Drinking Water Operations and Utility Maintenance Branch prior to beginning excavation to coordinate the EAP in the event a water line shut down becomes necessary.
 - 2. Notify Drinking Water Operations a minimum of 1 week prior to beginning construction activities.
 - 3. Notify Drinking Water Operations a minimum of 48 hours prior to beginning SUE work near LDWL.
 - 4. Unless otherwise approved by County Engineer, perform construction activities between 7 AM and 7 PM, Monday through Friday. No work permitted around a LDWL on weekends or County Holiday.
 - 5. A County Inspector must be present during SUE or construction activities occurring within four feet or one diameter of the LDWL, whichever is greater, from a LDWL or appurtenance.

1.6 SUBMITTALS

- A. Conform to requirements of Section 01330 - Submittal Procedures.
- B. Submit planned typical method of excavation, backfill placement and compaction including:
 - 1. Trench widths.

2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.
 3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.
- C. Submit backfill material sources and product quality information in accordance with requirements of Section 02320 - Utility Backfill Materials.
- D. Submit trench excavation safety program in accordance with requirements of Section 02260 - Trench Safety System. Include designs for special shoring meeting requirements defined in Paragraph 1.08, Special Shoring Design Requirements contained herein.
- E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.
- F. Submit 11-inch by 17-inch or 12-inch by 18-inch copy of Drawing with plotted utility or obstruction location titled "Critical Location Report" to Project Manager.
- G. For installation of proposed utility adjacent to or across existing LDWL, prepare and submit the following to Drinking Water Operations prior to beginning construction activities. Obtain approval from Drinking Water Operations prior to commencing prelocate or utility work near LDWL.
1. Trench details, shoring system designs, installation sequences, and flowable fill mix designs.
 2. Emergency Action Plan (EAP) to address contingency plans in the event of damage to or failure of LDWL. Include the following:
 - a. Contact personnel and agencies including primary and secondary telephone numbers.
 - b. Contractor's hierarchy of responsible personnel.
 - c. Traffic control measures.
 - d. Identification of resources to be available on or near project site in event of damage to or failure of LDWL.

1.7 TESTS

- A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by Fort Bend County in accordance with requirements of Section 01454 - Testing Laboratory Services and as specified in this Section.
- B. Perform backfill material source qualification testing in accordance with requirements of Section 02320 - Utility Backfill Materials.

1.8 SPECIAL SHORING DESIGN REQUIREMENTS

- A. Have special shoring designed or selected by Contractor's Professional Engineer to provide support for sides of excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by Contractor's Professional Engineer to meet project site requirements based on manufacturer's standard design.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Perform excavation with hydraulic excavator or other equipment suitable for achieving requirements of this Section.
- B. Use only hand-operated tamping equipment until minimum cover of 12-inches is obtained over pipes, conduits, and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.
- C. Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.
- D. Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, or other systems meeting requirements as specified in Paragraph 1.08, Special Shoring Design Requirements.

2.02 MATERIAL CLASSIFICATIONS

- A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Section 02320 - Utility Backfill Materials and Section 02321 – Cement Stabilized Sand.
- B. Concrete Backfill: Conform to requirements for Class B concrete as specified in Section 03315 - Concrete for Utility Construction.
- C. Geotextile (Filter Fabric): Conform to requirements of Section 02621 Geotextile.
- D. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

PART 3 - EXECUTION

3.01 STANDARD PRACTICE

- A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.
- B. Install rigid pipe to conform to standard practice described in ASTM C 12, C 1479, or C 1675as applicable, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section

governs.

3.02 PREPARATION

- A. Establish traffic control to conform to requirements of Section 01555 - Traffic Control and Regulation. Maintain barricades and warning lights for streets and intersections affected by Work, and are considered hazardous to traffic movements.
- B. Perform work to conform to applicable safety standards and regulations. Employ trench safety system as specified in Section 02260 - Trench Safety Systems.
- C. Immediately notify agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from Project Manager and agency for any repairs or relocations, either temporary or permanent.
- D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Section 02221 - Removing Existing Pavements, Structures, Wood and Demolition Debris, as applicable.
- E. Install and operate necessary dewatering and surface-water control measures to conform to Section 01578 - Control of Ground and Surface Water. Provide stable trench to allow installation in accordance with Specifications.
- F. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Section 01725 - Field Surveying.

3.03 CRITICAL LOCATION INVESTIGATION

- A. Horizontal and vertical location of various underground lines shown on Drawings, including but not limited to water lines, gas lines, storm sewers, sanitary sewers, telecommunication lines, electric lines or power ducts, pipelines, concrete and debris, are based on best information available but are only approximate locations. Unless otherwise approved by Project Manager, at Critical Locations shown on Drawings, perform vacuum excavation to field verify horizontal and vertical locations of such lines within a zone 2 feet vertically and 4 feet horizontally of proposed work exclude water jetting at PCCP water line.
 - 1. Verify location of existing utilities minimum of 7 working days in advance of pipe laying activities based on daily pipe laying rate or prior to beginning installation of auger pit or tunnel shaft. Use extreme caution and care when uncovering utilities designated by Critical Locate.
 - 2. Notify Project Manager in writing immediately upon identification of obstruction. In event of failure to identify obstruction in minimum of 7 days, Contractor will not be entitled to extra cost for downtime including, but not limited to, payroll, equipment, overhead, demobilization and remobilization, until 7 days has passed from time Project Manager is notified of obstruction.
- B. Notify involved utility companies of date and time that investigation excavation will occur and request that their respective utility lines be marked in field. Comply with utility or pipeline company requirements that their representative be present during excavation. Provide Project Manager with 48 hours notice prior to field excavation or related work.

- C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot on 12-inch by 18-inch copy of Drawings. For large diameter water lines, submit to Project Manager for approval, horizontal and vertical alignment dimensions for connections to existing lines, tied into project baseline, signed and sealed by R.P.L.S.
- D. LDWL Prelocate Requirements:
 - 1. Field-locate LDWL, appurtenances and laterals connected directly to LDWL through use of non-probing method such as a vacuum truck (non-water jetting method) at no greater than 50-foot intervals. Locate upstream and downstream of proposed work or utility installation.
 - 2. Record crown and side of LDWL adjacent to proposed work or utility installation. Record LDWL locations horizontally and vertically using same coordinate system employed on proposed utility drawings.
 - 3. Tie horizontal and vertical coordinates into project baseline. Submit recordings performed by R.P.L.S to County a minimum of 14 days prior to mobilizing to site.

3.04 PROTECTION

- A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings, and in accordance with requirements of Section 01562 - Tree and Plant Protection.
- B. Protect and support above-grade and below-grade utilities which are to remain.
- C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.
- D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, re-compact, and pave those areas at no additional cost to County.
- E. Contingency plans for proposed work or utility installation adjacent to or across a LDWL:
 - 1. Conduct on-site emergency drill prior to commencing proposed utility installation, and at three month intervals to assure EAP is current.
 - 2. In the event a LDWL shut down becomes necessary, secure site and provide assistance to County personnel to access pipe and isolation valves as needed.

3.05 EXCAVATION

- A. Except as otherwise specified or shown on Drawings, install underground utilities in open cut trenches with vertical sides.
- B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

- C. Determine trench excavation widths using following schedule as related to pipe outside diameter (O.D.). Excavate trench so that pipe is centered in trench.

Nominal Pipe Size, Inches	Minimum Trench Width, Inches
Less than 18	O.D. + 18
18 to 30	O.D. + 24
36 to 42	O.D. + 36
Greater than 42	O.D. + 48

Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

- D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.
- E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify Project Manager and obtain instructions before proceeding.
- F. Shoring of Trench Walls.
1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.
 2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.
 3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by Project Manager. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.
 4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.
 5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of 1-inch-thick steel plate. As sheeting is removed, fill in voids left with grouting material.
- G. Use of Trench Shields. When trench shield (trench box) is used as worker safety device,

the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.
 2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re- compact after shield is moved if soil is disturbed.
 3. When required, place, spread, and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.
 4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.
 5. Conform to applicable Government regulations.
- H. Voids under paving area outside shield caused by Contractor's work will require removal of pavement, consolidation and replacement of pavement in accordance with Contract Documents. Repair damage resulting from failure to provide adequate supports.
- I. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.
- J. Coordinate excavation within 15 feet of pipeline with company's representative. Support pipeline with methods agreed to by pipeline company's representative. Use small, rubber- tired excavator, such as backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have guard installed over teeth to approximate bucket without teeth. Excavate by hand within 1 foot of Pipeline Company's line. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by Pipeline Company's representative.
- K. When, during excavation to uncover pipeline company's pipelines, screwed collar or an oxy- acetylene weld is exposed, immediately notify Project Manager. Provide supports for collar or welds. Discuss with Pipeline Company's representative and determine methods of supporting collar or weld during excavation and later backfilling operations. When collar is exposed, request Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.
- L. Excavation and shoring requirements for proposed work or utility installation adjacent to or across a LDWL:
1. Identify LDWL area in field and barricade off from construction activities. Allow no construction related activities including, but not limited to, loading of dump trucks and material staging or storage, on top of LDWL.
 2. Employ a groundwater control system when performing excavation activities within ten feet of LDWL to:

-
- a. Effectively reduce hydrostatic pressure affecting excavations,
 - b. Develop substantially dry and stable subgrade for subsequent construction operations,
 - c. Prevent loss of fines, seepage, boils, quick condition or softening of foundation strata, and
 - d. Maintain stability of sides and bottom of excavations.
3. When edge of proposed trench or shoring is within a distance equal to one diameter of LDWL from outside of wall of LDWL, valve or appurtenance:
- a. Maintain minimum of four (4) feet horizontal clearance and minimum of two (2) feet vertical clearance between proposed utility and LDWL.
 - b. Auger Construction
 - 1) Maintain minimum of four (4) feet horizontal clearance between proposed utility and LDWL.
 - 2) Dry auger method required when auger hole is 12-inches and larger in diameter.
 - c. Open Cut Construction and Auger pits
 - 1) Perform hand excavation when within four (4) feet of LDWL.
 - 2) Employ hydraulic or pneumatic shoring system. Do not use vibratory or impact driven shoring or piling.
 - 3) Expose no more than 30-feet of trench prior to backfilling.
 - 4) A maximum of one (1) foot of vertical trench shall be un-braced at a time to maintain constant pressure on face of excavated soil.
 - 5) Upon removal of shoring system, inject flowable fill into void space left behind by shoring system. Comply with Standard Specification 02322 - Flowable Fill.
 - d. When edge of utility excavation is greater than one diameter of LDWL from outside wall of LDWL, use a shielding system as required by Project Manager and proposed utility standards and practices.

3.06 HANDLING EXCAVATED MATERIALS

- A. Use only excavated materials, which are suitable as defined in this Section and conforming to Section 02320 - Utility Backfill Materials. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.
- B. When required, provide additional backfill material conforming to requirements of Section 02320 - Utility Backfill Materials.

- C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Maintain site conditions in accordance with Section 01504 - Temporary Facilities and Controls. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

3.07 TRENCH FOUNDATION

- A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.
- B. When wet soil is encountered on trench bottom and dewatering system is not required, over excavate an additional 6-inches with approval by Project Manager. Place non-woven geotextile fabric and then compact 12-inches of crushed stone in one lift on top of fabric. Compact crushed stone with four passes of vibratory-type compaction equipment.
- C. Perform over excavation, when directed by Project Manager, in accordance with Paragraph 3.07.B above. Removal of unstable or unsuitable material may be required if approved by Project Manager;
 - 1. Even though Contractor has not determined material to be unsuitable, or
 - 2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating according to Section 01578 - Control of Ground and Surface Water.
- D. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.08 PIPE EMBEDMENT, PLACEMENT, AND COMPACTION

- A. Remove loose, sloughing, caving, or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.
- B. Place embedment including bedding, haunching, and initial backfill as shown on Drawings.
- C. For pipe installation, manually spread embedment materials around pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and compaction directly against undisturbed soils in trench sidewalls, or against sheeting which is to remain in place.
- D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.
- E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.
- F. Do not damage coatings or wrappings of pipes during backfilling and compacting

operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

- G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.
- H. Place electrical conduit, if used, directly on foundation without bedding.
- I. Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.
- J. For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Section 02320 - Utility Backfill Material. Adhere to the following subparagraph numbers 1 and 2.
 - 1. Class I, II and III Embedment Materials:
 - a. Maximum 6-inches compacted lift thickness.
 - b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
 - c. Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Project Manager.
 - 2. Cement Stabilized Sand (where required for special installations):
 - a. Maximum 6-inches compacted thickness.
 - b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
 - c. Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.
- K. For Sanitary Sewers adhere to subparagraph number 1 and 2. For Storm Sewers provide cement stabilized sand per paragraph 2. This provision does not apply to Storm Sewers constructed of HDPE pipe installed under pavement.
 - 1. Class I Embedment Materials.
 - a. Maximum 6-inches compacted lift thickness.
 - b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.
 - c. Moisture content as determined by Contractor for effective

compaction without softening soil of trench bottom, foundation or trench walls.

2. Class II Embedment and Cement Stabilized Sand.
 - a. Maximum 6-inches compacted thickness.
 - b. Compaction by methods determined by Contractor to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.
 - c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.
- L. For Storm Sewers constructed of any flexible pipe product and installed under pavement provide flowable fill pipe embedment as specified in Section 02322 - Flowable Fill.
- M. Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.09 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

- A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.
- B. For water lines, under pavement and to within one foot back of curb, use backfill materials described below:
 1. For water lines 20-inches in diameter and smaller, use bank run sand or select backfill materials up to pavement base or subgrade.
 2. For water lines 24-inches in diameter and larger, backfill with suitable on-site material (random backfill) up to 12-inches below pavement base or subgrade. Place minimum of 12-inches of select backfill below pavement base or subgrade.
- C. For sewer pipes (Storm and Sanitary), use backfill materials described by trench limits. For "trench zone backfill" under pavement and to within one foot back of curb, use cement stabilized sand for pipes of nominal sizes 36-inches in diameter and smaller to level 12 inches below the pavement. For sewer pipes 42-inches in diameter and larger, under pavement or natural ground, backfill from 12-inches above top of pipe to 120 inches below pavement with suitable on-site material or select backfill. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12-inch backfill directly under pavement. For backfill materials reference Section 02320 - Utility Backfill Materials. This provision does not apply where a Storm Sewer is constructed of any flexible pipe product.

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- D. For Storm Sewers constructed of any flexible pipe product and installed under pavement provide flowable fill as specified in Section 02322 - Flowable Fill. For Storm Sewers constructed of any flexible pipe product and not installed under pavement provide cement stabilized sand.
- E. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave sheeting in place. Cut off sheeting 1.5-feet or more above crown of pipe sheeting, leave sheeting in place. Cut off sheeting 1.5-feet or more above crown of pipe. Remove trench supports within 5-feet from ground surface.
- F. Unless otherwise shown on Drawings. Use one of the following trench zone backfills under pavement and to within one foot of edge of pavement. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift.
1. Class I, II, or III or combination thereof:
 - a. Place in maximum 12-inch thick loose layers.
 - b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
 - c. Moisture content within zero percent to 5 percent above optimum determined according to ASTM D 698, unless otherwise approved by Project Manager.
 2. Cement-Stabilized Sand:
 - a. Maximum lift thickness determined by Contractor to achieve uniform placement and required compaction, but do not exceed 12-inches.
 - b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 558.
 - c. Moisture content on dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.
 3. Class IVA and IVB (Clay Soils):
 - a. Place in maximum 8-inch thick loose lifts.
 - b. Compaction by vibratory Sheepfoot roller to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
 - c. Moisture content within zero percent to 5 percent above optimum determined according to ASTM D 698, unless approved by Project Manager.
- G. Unless otherwise shown on Drawings, for trench excavations not under pavement, random backfill of suitable material may be used in trench zone. This provision does not apply to flexible pipe used for storm sewers.

1. Fat clays (CH) may be used as trench zone backfill outside paved areas at Contractor's option. When required density is not achieved, at any additional cost to County, rework, dry out, use lime stabilization or other approved methods to achieve compaction requirements, or use different suitable material.
 2. Maximum 9-inch compacted lift thickness for clayey soils and maximum 12-inch lift thickness for granular soils.
 3. Compact to minimum of 90 percent of maximum dry density determined according to ASTM D 698.
 4. Moisture content as necessary to achieve density.
- H. For electric conduits, remove form work used for construction of conduits before placing trench zone backfill.

3.10 MANHOLES, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

- A. Below paved areas or where shown on Drawings, encapsulate manhole with cement stabilized sand; minimum of 2 foot below base, minimum 2 foot around walls, up to pavement subgrade or natural ground. Compact in accordance with Paragraph 3.09.F.2 of this Section
- B. In unpaved areas, use select fill for backfill. Existing material that qualifies as select material may be used, unless indicated otherwise on Drawings. Deposit backfill in uniform layers and compact each layer as specified. Maintain backfill material at no less than 2 percent below nor more than 5 percent above optimum moisture content, unless otherwise approved by Project Manager. Place fill material in uniform 8-inch maximum loose layers. Compact fill to at least 95 percent of maximum Standard Proctor Density according to ASTM D 698.
- C. For LDWL projects, encapsulate manhole with cement stabilized sand; minimum of 1 foot below base, minimum of 2 feet around walls, up to within 12-inches of pavement subgrade or natural ground. For manholes over water line, extend encapsulation to bottom of trench. Compact in accordance with Paragraph 3.09 F.2 of this Section.

3.11 FIELD QUALITY CONTROL

- A. Test for material source qualifications as defined in Section 02320 - Utility Backfill Materials.
- B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no additional cost to County.
- C. Tests will be performed on minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity, or when requested by Project Manager.
- D. At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement- stabilized sand in accordance with ASTM D 558. Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

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- E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions.
1. For open cut construction projects and auger pits: Unless otherwise approved by Project Manager, successful compaction to be measured by one test per 40 linear feet measured along pipe for compacted embedment and two tests per 40 linear feet measured along pipe for compacted trench zone backfill material. Length of auger pits to be measured to arrive at 40 linear feet.
 2. A minimum of three density tests for each full shift of Work.
 3. Density tests will be distributed among placement areas. Placement areas are: foundation, outer bedding, haunching, initial backfill and trench zone.
 4. The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.
 5. Density tests may be performed at various depths below fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.
 6. Two verification tests will be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.
 7. Recompacted placement will be retested at same frequency as first test series, including verification tests.
 8. Identify elevation of test with respect to natural ground or pavement.
- F. Recondition, re-compact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.
- G. Acceptability of crushed rock compaction will be determined by inspection.

3.12 DISPOSAL OF EXCESS MATERIAL

- A. Dispose of excess materials in accordance with requirements of Section 01576 - Waste Material Disposal.

END OF SECTION 33 05 28

SECTION 33 41 00 - STORM SEWAGE SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing storm sewers and appurtenant structures.

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section

1. AASHTO: American Association of State Highway and Transportation Officials
 - a. M 36: Specification for Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.
 - b. M 190: Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - c. M 252: Specification for Corrugated Polyethylene Drainage Tubing.
 - d. M 294: Specification for Corrugated Polyethylene Pipe 12 inch to 36-inch diameter.
2. ASTM: American Society for Testing and Materials
 - a. A 48: Specification for Gray Iron Castings.
 - b. A 74: Specification for Cast Iron Soil Pipe and Fittings.
 - c. C 40: Test Method for Organic Impurities in Fine Aggregate for Concrete.
 - d. C 76: Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - e. C 150: Specification for Portland Cement.
 - f. C 443: Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
 - g. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - h. D 618: Conditioning Plastics and Electrical Insulating Materials for Testing.
 - i. D 1248: Polyethylene Plastics Molding and Extrusion Material.
 - j. D 1693: Environmental Stress Cracking of Ethylene Plastics.

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- k. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - l. D 2239: Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - m. D 2412: Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
 - o. D 2447: Specifications for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
 - p. D 2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - q. D 2467: Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - r. D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
 - s. D 2665: Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
 - t. D 2729: Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - u. D 2855: Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
 - v. D 3035: Specifications for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
 - w. D 3212: Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - x. D 3261: Specification for Butt Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - y. D 3350: Specification for Polyethylene Plastics Pipe and Fittings Material.
 - z. F 402: Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
 - aa. F 405: Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
 - bb. F 412: Standard Terminology Relating to Plastic Piping Systems.
 - cc. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - dd. F 656: Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Pipes and Fittings.

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- ee. F 714: Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - ff. F 913: Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - gg. F 667: Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
3. Federal Specification
- a. SS-S-210A and Latest Amendments: Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

1.3 SUBMITTALS

- A. In accordance with Section 013300 – Submittal Procedures of these Specifications, the following shall be submitted:
 - 1. Certificates
 - a. Manufacturer's certificates and load tickets stating that materials meet specified requirements.
 - 2. Shop Drawings
 - a. Shop Drawings and details of all storm sewers and drains, including relationship to other systems and true position and details of all interfaces, connections, inlets, clean- outs, manholes, alignment and grade, changes of direction, offsets, bedding and protection, materials, manufacturer's installation and connection instructions and recommendations, and all other pertinent data.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products for use within Fort Bend County right-of-way shall meet the applicable requirements.

2.2 PIPES AND FITTINGS

- A. Reinforced Concrete Pipe (RCP)
 - 1. ASTM C 76, bell-and-spigot, Class III, Wall B.
- B. Corrugated Galvanized Metal Pipe (CGMP)
 - 1. AASHTO M 36, coated and paved in accordance with AASHTO M 190, Type C coating for pipe and Type A coating for coupling bands.

C. PVC Pipe in accordance with the following:

1. ASTM D 1785.
2. ASTM D 2241.
3. ASTM D 2466.
4. ASTM D 2467.

D. PE Pipe

1. ASTM D 2447.
2. ASTM D 3035.
3. ASTM D 3350 Type PE 3408.
4. ASTM F 714 Type PE 3408.

2.3 JOINTS

A. Gaskets for RCP in accordance with the following:

1. Federal Specification SS-S-210A.
2. ASTM C 443.

B. All joints in PVC plastic pipe shall be solvent cemented in accordance with the following:

1. ASTM D 2564.
2. ASTM D 2672.
3. ASTM D 2855.
4. ASTM F 402.
5. ASTM F 656.

C. All joints in PE plastic pipe shall be fusion butt-welded in accordance with ASTM3261.

2.4 DRAINAGE STRUCTURES

A. Manhole

Type as indicated on the Drawings and conforming to applicable Standards for Fort Bend County Right-of-Way. Frame and Cover ASTM A 48 Class 35 B.

B. Inlet

Type as indicated on the Drawings and conforming to applicable Standards in Fort Bend County Right-of-Way. Frame and Grate ASTM A 48 Class 35 B.

C. Reinforcing Steel

As specified in Section 032100 - Concrete Reinforcement of these Specifications.

D. Cast-in-Place Concrete (Class 3000)

As specified in Section 321373.19 - Cast-in-Place Concrete of these Specifications.

E. Mortar (Type M)

2.5 CEMENT-STABILIZED SAND BACKFILL

A. Aggregate

Use clean sand; deleterious materials in the sand shall not exceed the following limitations, by weight:

Material removed by denatation	5.0 percent
Clay lumps	0.5 percent
Other deleterious substances such as coal, shale, coated grains of soft flaky particles.	2.0 percent

Gradation Requirements:

Retained on 3/8-in. sieve	0 percent
Retained on 1/4-in. sieve	0 - 5 percent
Retained on 20-mesh sieve	15 - 50 percent
Retained on 100-mesh sieve	80 - 100 percent

Color test per ASTM C 40, color not darker than standard color.

B. Cement

ASTM C 150, Type I or II.

C. Water

Potable, from municipal supplies approved by the State or County Health Department.

D. Mixture

Use at least 1-1/2 sacks of cement per cubic yard of mixture. Use amount of water required to provide mix suitable for mechanical hand tamping and mix in approved mixer. Stamp load tickets at plant with time of loading. Material not in place within 1-1/2 hours after loading or that has obtained an initial set will be rejected and shall be removed from the Site and replaced with new acceptable mixtures at no additional cost to OWNER.

2.6 TIMBER POSTS

- A. Southern Pine or Douglas Fir, pressure-treated in accordance with American Wood Preservers' Association (AWPA) Standards.

PART 3 - EXECUTION

3.1 GENERAL

- A. All storm sewer work performed within Houston right-of-way shall meet the applicable requirements.

3.2 EXCAVATION

- A. All excavation shall be in accordance with Section 017330 - Trench Safety Systems of these Specifications.
- B. Perform excavation for storm sewer and storm sewer drainage structures to line and grade required as shown on the Drawings and as specified herein.
- C. If the excavation exceeds the permissible dimensions, extend the encasement or install pipe of higher strength, as directed.
- D. Prevent surface or ground water from flowing into excavation. Install, operate, and maintain dewatering system to convey water away from excavation. Notify the Engineer in writing of delays to the Work caused by water intrusion.

3.3 PIPE ENCASEMENT

- A. Place cement-stabilized sand bedding before laying pipe. Bedding shall be compacted and shaped to fully support the pipe.
- B. After the pipe is laid, place cement-stabilized sand beside and above the pipe in 4 in. lifts to the limits shown on the construction drawings. Compact individual lifts with a hand-operated, motorized tamper; exercise care to avoid damaging the pipe.

3.4 LAYING PIPE

- A. Install and joint pipe in accordance with the pipe manufacturer's instructions and as specified herein.
- B. Provide a minimum of 6 in. clearance between storm sewer and sanitary sewer.
- C. Seal open end of pipe with plug when pipe laying operation is temporarily halted. Plug shall remain in place until operation restarts.

3.5 BACKFILL

- A. On completion of construction, backfill the excavation as specified in Section 312300 –

Excavation, Grading, and Fill of these Specifications and in accordance with details on the construction drawings. Backfill only when the written approval of the Engineer is obtained to do so.

3.6 CONSTRUCTION OF MANHOLES AND INLETS

A. General

1. Construct manholes and inlets as soon as practical after sewer lines into or through the manhole or inlet locations are completed.
2. Construct manholes and inlets at locations and of the type indicated. All manholes within 9 feet of existing water lines shall be watertight.

B. Manholes

1. Provide base of the shape and size required with a minimum thickness of 12 inches.
2. Place axis of manholes directly over the centerlines of the lines, unless otherwise indicated.
3. Shall be constructed of either precast or cast-in-place concrete.

C. Inlets

1. Shall be constructed of either precast or cast-in-place concrete.

3.7 CLEANUP

- #### **A.**
- Remove temporary structures, rubbish, waste materials, and excess excavated materials from the Site and dispose of legally.

END OF SECTION 33 41 00

CLOSE OUT DOCUMENTS

ASE Project No. 23-274
December 4, 2023 – December 30, 2023
January 4-5, 2024

ASBESTOS ABATEMENT

Flooring/Mastic, Air Cell TSI, Transite Paneling, and Parapet Wall
Vacant Structure
1207 Oak Street
La Marque, TX 77568

PREPARED FOR:

Mr. Mark Garcia
Galveston County
722 Moody Avenue
Galveston, TX 77550



SETX Environmental, Inc.
Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA's

Close Out Table of Contents

- 1) Job Specifications
 - a) Notifications
 - b) Asbestos Surveys
 - c) Agency License & Insurance

- 2) Daily Logs

- 3) Air Monitoring Forms and Results

- 4) Pertinent Correspondence



SETX Environmental, Inc.
Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA's

Mr. Mark Garcia
Galveston County
722 Moody Avenue
Galveston, TX 77550

January 9, 2024
ASE Project No. 23-274

Re: Air Monitoring and Project Management (Asbestos Abatement)

Site: Vacant Structure – 1207 Oak Street, La Marque, TX 77568

Mr. Garcia,

SETX Environmental, Inc. (dba ASE Services) conducted Project Management and Air Monitoring Services at the above-referenced location. RNDI Companies, Inc. conducted the abatement activities. This project was initiated on December 4, 2023 and was completed on December 30, 2023. The scope of work consisted of the removal of approximately 14,600 square feet of 12" x 12" flooring and mastic, approximately 120 linear feet of Air Cell TSI, and approximately 3,000 square feet of transite paneling. The NESHAP demolition portion of the project was initiated on January 4 and completed on January 5, 2024. This consisted of the removal of approximately 150 linear feet of exterior parapet walls with asbestos-containing mastic.

The attached Close Out documentation should be kept in the building's permanent records.

All areas being abated were air monitored and analyzed under the NIOSH 7400 Method as required by The Texas Department of State Health Services

If you have any questions, please feel free to call me anytime. Again, your business is greatly appreciated.

Respectfully:

A handwritten signature in black ink that reads "Jerry G. Sonier". The signature is written in a cursive style.

Jerry G. Sonier
President



SETX Environmental, Inc.
dba ASE Services
Environmental Testing and Consulting
Asbestos – Mold – Lead – ESA’s

Project Daily Log

Date: 12-4-2023	Job No: 23-274	Page <u> 1 </u> of <u> 1 </u>
Client: Galveston County	Job Description: Removal of TSI/Demo	
Project Address: 1207 Oak Street, La Marque, TX 77568		

Time:	Activities:
7:00	SETX Project Manager and RNDI abatement crew arrived at job site.
7:10	SETX Project Manager and RNDI supervisor discussed and did a walk through of the work area.
8:00	Dave Morton from SETX arrived at job site to check on the ongoing project and collect more samples.
8:30	SETX Project manager conducted baseline air monitoring.
10:00	SETX Project manager concluded baseline air monitoring.
10:15	RNDI abatement workers started demolishing NON-ACM walls in the work area.
10:45	One of the abatement workers started removal of TSI/Insulation using glovebag method. SETX Project manager conducted ambient air monitoring (Upwind and Downwind) and personal air monitoring.
11:30	Abatement worker completed removal of TSI/Insulation using glovebag method. SETX Project manager concluded ambient air monitoring (Upwind and Downwind) and personal air monitoring.
12:00	All personnel leave for lunch break.
13:00	All personnel return from lunch break
13:05	RNDI abatement workers continue demolition of NON-ACM walls in the work area.
14:00	Lajuan Harris arrived at job site to check on the ongoing project.
15:00	Demolition of NON-ACM walls continue.
15:50	RNDI abatement workers halted NON-ACM demolition in the work area.
16:00	All personnel leave job site.
Project Manager: <u>Oluwaseun Olalekan</u> #501826	



SETX Environmental, Inc.
dba ASE Services
Environmental Testing and Consulting
Asbestos – Mold – Lead – ESA’s

Project Daily Log

Date: 12-19-2023	Job No: 23-274	Page <u> 1 </u> of <u> 1 </u>
Client: Galveston County	Job Description: ACM Removal	
Project Address: 1207 Oak Street, La Marque, TX 77568		

Time:	Activities:
7:00	SETX Project Manager and RNDI abatement crew arrived at job site.
7:05	SETX Project Manager and RNDI supervisor discussed where work will commence for the day.
7:20	SETX Project manager calibrated pumps.
7:30	RNDI Abatement workers continued prep work in the work area(South-East).
10:30	RNDI abatement workers concluded prep work; SETX Project manager conducted pre-abatemnt inspection.
10:40	Abatement workers suit up in their appropriate PPEs.
10:45	RNDI abatement workers started wet removal of floor tiles/black mastic and Transite pannels in the work area (South-East wing); SETX Project manager conducted ambient and personal air monitoring.
11:30	Manometer reading is -0.024.
12:00	All personnel leave for lunch break.
13:00	All personnel return from lunch break
13:05	RNDI abatement workers resume wet removal of floor tiles/black mastic and Transite pannels.
14:25	Lajuan Harris arrived at job site and took some pictures.
15:40	RNDI abatement workers halted wet removal of floor tiles/black and Transite pannels. SETX Project manager concluded ambient and personal air monitoring for the day.
16:00	All personnel leave job site.
Project Manager: Oluwaseun Olalekan #501826	



SETX Environmental, Inc.
dba ASE Services
Environmental Testing and Consulting
Asbestos – Mold – Lead – ESA’s

Project Daily Log

Date: 12-20-2023	Job No: 23-274	Page __1__ of __1__
Client: Galveston County	Job Description: ACM Removal	
Project Address: 1207 Oak Street, La Marque, TX 77568		

Time:	Activities:
7:00	SETX Project Manager and RNDI abatement crew arrived at job site.
7:10	SETX Project Manager and RNDI supervisor discussed where work will commence for the day.
7:15	SETX Project manager calibrated pumps.
7:20	Abatement workers suit up in their appropriate PPEs.
7:30	RNDI abatement workers started wet removal of floor tiles/black mastic and transite pannels in the work area (South-East wing); SETX Project manager conducted ambient and personal air monitoring.
9:30	Manometer reading is -0.022.
12:00	All personnel leave for lunch break.
13:00	All personnel return from lunch break
13:05	RNDI abatement workers resume wet removal of floor tiles/black mastic.
13:25	Fire Mashalls came to the job site and informed the abatement crew to stop the Non-ACM demolition due to lack of permit.
14:00	Lajuan Harris arrived at job site.
15:15	Abatement workers loaded double bagged ACM into the dumpster.
15:45	RNDI abatement workers halted wet removal of floor tiles/black and transite pannels. SETX Project manager concluded ambient and personal air monitoring for the day.
16:00	All personnel leave job site.
Project Manager: Oluwaseun Olalekan #501826	



SETX Environmental, Inc.
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Environmental Testing and Consulting
Asbestos - Mold - Lead - ESA's

Project Daily Log

Date: 12-21-2023	Job No: 23-274	Page <u> 1 </u> of <u> 1 </u>
Client: Galveston County	Job Description: ACM Removal	
Project Address: 1207 Oak Street, La Marque, TX 77568		

Time:	Activities:
7:00	SETX Project Manager and RNDI abatement crew arrived at job site.
7:10	SETX Project Manager and RNDI supervisor discussed where work will commence for the day.
7:20	SETX Project manager calibrated pumps.
7:25	Abatement workers suit up in their appropriate PPEs.
7:35	RNDI abatement workers started final detailing in the work area (South-East wing).
8:30	Manometer reading is -0.025.
8:45	SETX conducted visual inspection.
9:00	SETX Project Manager conducted final clearance air monitoring.
10:30	SETX Project Manager concluded final clearance air monitoring.
11:00	SETX Project manager analyzed the final clearance samples.
11:40	SETX Project manager that the final clearance samples passed.
12:00	All personnel leave for lunch break.
13:00	All personnel return from lunch break
13:10	RNDI abatement workers tore down the containment.
13:30	RNDI started prepping the south-west wing of the work area.
15:45	RNDI abatement workers halted prep work in the work area (South-West).
16:00	All personnel leave job site.
Project Manager: Oluwaseun Olalekan #501826	



SETX Environmental, Inc.
dba ASE Services
Environmental Testing and Consulting
Asbestos – Mold – Lead – ESA’s

Project Daily Log

Date: 12-28-2023	Job No: 23-274	Page __1__ of __1__
Client: Galveston County	Job Description: ACM Removal	
Project Address: 1207 Oak Street, La Marque, TX 77568		

Time:	Activities:
7:00	SETX Project Manager and RNDI abatement crew arrived at job site.
7:05	SETX Project Manager and RNDI supervisor discussed where work will commence for the day.
7:10	SETX Project manager calibrated pumps.
7:15	Abatement workers suit up in their appropriate PPEs.
7:20	RNDI abatement workers started wet removal of floor tiles/black mastic and transite pannels in the work area (South-West wing); SETX Project manager conducted ambient and personal air monitoring. Non-ACM demolition is ongoing.
8:30	Manometer reading is -0.023.
10:30	Project is in compliance.
12:00	All personnel leave for lunch break.
13:00	All personnel return from lunch break
13:10	RNDI abatement workers resume wet removal of floor tiles/black mastic and transite pannels. Non-ACM demolition continues.
15:00	Abatement workers loaded double bagged ACM into the dumpster.
15:40	RNDI abatement workers halted wet removal of floor tiles/black and transite pannels. SETX Project manager concluded ambient and personal air monitoring for the day.
16:00	All personnel leave job site.
Project Manager: Oluwaseun Olalekan #501826	



SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/4/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
B120401	12/4/23	BASELINE	8:30	10:00	90	15.0	1350	1	1.3	0.000
B120402	12/4/23	BASELINE	8:31	10:01	90	15.0	1350	1	1.3	0.000
B120403	12/4/23	BASELINE	8:32	10:02	90	15.0	1350	1	1.3	0.000
A120401	12/4/23	Upwind	10:45	11:30	45	3.0	135	1	1.27	0.004
A120402	12/4/23	Downwind	10:46	11:31	45	3.0	135	1.5	1.911	0.005
A120403	12/4/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/4/2023	Received By:	Oluwaseun Olalekan	Date	12/4/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/5/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A120501	12/5/23	Upwind	8:00	15:50	470	3.0	1410	2.5	3.185	0.001
A120502	12/5/23	Downwind	8:01	15:51	470	3.0	1410	3.5	4.459	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/5/2023	Received By:	Oluwaseun Olalekan	Date	12/5/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/6/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A120601	12/6/23	Upwind	7:30	15:45	495	3.0	1485	2.0	2.548	0.001
A120602	12/6/23	Downwind	7:31	15:46	495	3.0	1485	2.5	3.185	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/6/2023	Received By:	Oluwaseun Olalekan	Date	12/6/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/7/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A120701	12/7/23	Upwind/Prep	8:00	15:50	470	3.0	1410	2.0	2.548	0.001
A120702	12/7/23	Downwind/Prep	8:01	15:51	470	3.0	1410	2.5	3.185	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/7/2023	Received By:	Oluwaseun Olalekan	Date	12/7/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/8/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A120801	12/8/23	Upwind/Prep	7:40	15:45	485	3.0	1455	1.5	1.911	0.001
A120802	12/8/23	Downwind/Prep	7:41	15:46	485	3.0	1455	2.5	3.185	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/8/2023	Received By:	Oluwaseun Olalekan	Date	12/8/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/11/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121101	12/11/23	Upwind/Prep	7:20	15:25	485	3.0	1455	2.0	2.5	0.001
A121102	12/11/23	Downwind/Prep	7:21	15:26	485	3.0	1455	2.5	3.2	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/11/2023	Received By:	Oluwaseun Olalekan	Date	12/11/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/12/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121201	12/12/23	Inside Work Area/North Wing	7:30	15:40	490	3.0	1470	4.5	5.7	0.002
A121202	12/12/23	Outside Work Area/North Wing	7:31	15:41	490	3.0	1470	1.5	1.9	0.001
A121203	12/12/23	Neg Air/North Wing	7:32	15:42	490	3.0	1470	2	2.5	0.001
A121204	12/12/23	Clean Room/North Wing	7:33	15:43	490	3.0	1470	1.5	1.9	0.001
A121205	12/12/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/12/2023	Received By:	Oluwaseun Olalekan	Date	12/12/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/13/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121301	12/13/23	Inside Work Area/North Wing	7:25	15:45	500	3.0	1500	4.0	5.1	0.001
A121302	12/13/23	Outside Work Area/North Wing	7:26	15:46	500	3.0	1500	1.0	1.3	0.000
A121303	12/13/23	Neg Air/North Wing	7:27	15:47	500	3.0	1500	2	2.5	0.001
A121304	12/13/23	Clean Room/North Wing	7:28	15:48	500	3.0	1500	1.5	1.9	0.001
A121305	12/13/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/13/2023	Received By:	Oluwaseun Olalekan	Date	12/13/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/14/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121401	12/14/23	Inside Work Area/North Wing	7:35	15:50	495	3.0	1485	5.5	7.0	0.002
A121402	12/14/23	Outside Work Area/North Wing	7:36	15:51	495	3.0	1485	1.5	1.9	0.000
A121403	12/14/23	Neg Air/North Wing	7:37	15:52	495	3.0	1485	2.5	3.2	0.001
A121404	12/14/23	Clean Room/North Wing	7:37	15:53	495	3.0	1485	1.5	1.9	0.001
A121405	12/14/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/14/2023	Received By:	Oluwaseun Olalekan	Date	12/14/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/15/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121501	12/15/23	Inside Work Area/North Wing	7:30	15:45	495	3.0	1485	4.0	5.1	0.001
A121502	12/15/23	Outside Work Area/North Wing	7:31	15:46	495	3.0	1485	1.5	1.9	0.000
A121503	12/15/23	Neg Air/North Wing	7:32	15:47	495	3.0	1485	2.0	2.5	0.001
A121504	12/15/23	Clean Room/North Wing	7:33	15:48	495	3.0	1485	1.5	1.9	0.000
A121505	12/15/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/15/2023	Received By:	Oluwaseun Olalekan	Date	12/15/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/18/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
F121801	12/18/23	Final Clearance/North Wing	8:30	10:00	90	15.0	1350	1.0	1.3	0.000
F121802	12/18/23	Final Clearance/North Wing	8:31	10:01	90	15.0	1350	1.5	1.9	0.001
F121803	12/18/23	Final Clearance/North Wing	8:32	10:02	90	15.0	1350	1.0	1.3	0.000
F121804	12/18/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/18/2023	Received By:	Oluwaseun Olalekan	Date	12/18/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/19/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A121901	12/19/23	Inside Work Area/South East Wing	10:45	15:40	295	3.0	885	5.5	7.0	0.003
A121902	12/19/23	Outside Work Area/ South East Wing	10:46	15:41	295	3.0	885	2.0	2.5	0.001
A121903	12/19/23	Neg Air/ South East Wing	10:47	15:42	295	3.0	885	2.5	3.2	0.001
A121904	12/19/23	Clean Room/ South East Wing	10:48	15:43	295	3.0	885	1.5	1.9	0.001
A121905	12/19/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/19/2023	Received By:	Oluwaseun Olalekan	Date	12/19/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/20/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122001	12/20/23	Inside Work Area/South East Wing	7:30	15:45	495	3.0	1485	6.0	7.6	0.002
A122002	12/20/23	Outside Work Area/ South East Wing	7:31	15:46	495	3.0	1485	2.0	2.5	0.001
A122003	12/20/23	Neg Air/ South East Wing	7:32	15:47	495	3.0	1485	2.5	3.2	0.001
A122004	12/20/23	Clean Room/ South East Wing	7:33	15:48	495	3.0	1485	1.5	1.9	0.000
A122005	12/20/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/20/2023	Received By:	Oluwaseun Olalekan	Date	12/20/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/21/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
F122101	12/21/23	Final Clearance/North Wing	9:00	10:30	90	15.0	1350	1.5	1.9	0.001
F122102	12/21/23	Final Clearance/North Wing	9:01	10:31	90	15.0	1350	1.0	1.3	0.000
F122103	12/21/23	Final Clearance/North Wing	9:02	10:32	90	15.0	1350	1.0	1.3	0.000
F122104	12/21/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/21/2023	Received By:	Oluwaseun Olalekan	Date	12/21/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/22/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122201	12/22/23	Upwind/Prep	7:20	15:25	485	3.0	1455	1.5	1.911	0.001
A122202	12/22/23	Downwind/Prep	7:21	15:26	485	3.0	1455	2.5	3.185	0.001

Relinquished By:	Oluwaseun Olalekan	Date:	12/22/2023	Received By:	Oluwaseun Olalekan	Date	12/22/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/26/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122601	12/26/23	Inside Work Area/South West Wing	7:30	15:45	495	3.0	1485	5.0	6.4	0.002
A122602	12/26/23	Outside Work Area/ South West Wing	7:31	15:46	495	3.0	1485	1.5	1.9	0.000
A122603	12/26/23	Neg Air/ South West Wing	7:32	15:47	495	3.0	1485	2.0	2.5	0.001
A122604	12/26/23	Clean Room/ South West Wing	7:33	15:48	495	3.0	1485	1.5	1.9	0.000
A122605	12/26/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/26/2023	Received By:	Oluwaseun Olalekan	Date	12/26/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/27/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122701	12/27/23	Inside Work Area/South West Wing	7:25	15:50	505	3.0	1515	5.5	7.0	0.002
A122702	12/27/23	Outside Work Area/ South West Wing	7:26	15:51	505	3.0	1515	1.5	1.9	0.000
A122703	12/27/23	Neg Air/ South West Wing	7:27	15:52	505	3.0	1515	2.5	3.2	0.001
A122704	12/27/23	Clean Room/ South West Wing	7:28	15:53	505	3.0	1515	1.5	1.9	0.000
A122705	12/27/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/27/2023	Received By:	Oluwaseun Olalekan	Date	12/27/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/28/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122801	12/28/23	Inside Work Area/South West Wing	7:20	15:40	500	3.0	1500	6.5	8.3	0.002
A122802	12/28/23	Outside Work Area/ South West Wing	7:21	15:41	500	3.0	1500	1.5	1.9	0.000
A122803	12/28/23	Neg Air/ South West Wing	7:22	15:42	500	3.0	1500	2.5	3.2	0.001
A122804	12/28/23	Clean Room/ South West Wing	7:23	15:43	500	3.0	1500	2.0	2.5	0.001
A122805	12/28/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/28/2023	Received By:	Oluwaseun Olalekan	Date	12/28/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/29/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A122901	12/29/23	Inside Work Area/South West Wing	7:35	11:00	205	3.0	605	3.0	3.8	0.002
A122902	12/29/23	Outside Work Area/ South West Wing	7:36	11:01	205	3.0	605	1.0	1.3	0.001
A122903	12/29/23	Neg Air/ South West Wing	7:37	11:02	205	3.0	605	1.5	1.9	0.001
A122904	12/29/23	Clean Room/ South West Wing	7:38	11:03	205	3.0	605	1.0	1.3	0.001
A122905	12/29/23	Blank								
F122905	12/29/23	Final Clearance	13:10	14:40	90	15	1350	1.0	1.3	0.000
F122905	12/29/23	Final Clearance	13:11	14:41	90	15	1350	1.0	1.3	0.000
F122905	12/29/23	Final Clearance	13:12	14:42	90	15	1350	1.0	1.3	0.000

Relinquished By:	Oluwaseun Olalekan	Date:	12/29/2023	Received By:	Oluwaseun Olalekan	Date	12/29/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	12/30/2023
Project Name:	Old Medical building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
A123001	12/30/23	Upwind/TSI removal	7:30	11:00	210	3.0	630	2.0	2.5	0.002
A123002	12/30/23	Downwind/TSI removal	7:31	11:01	210	3.0	630	2.5	3.2	0.002

Relinquished By:	Oluwaseun Olalekan	Date:	12/30/2023	Received By:	Oluwaseun Olalekan	Date	12/30/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

OSHA AIR MONITORING LOG

Project #:	23-274	Date:	12/4/2023
Project Name:	Old Medical Building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
P120401	12/4/23	STEL/Efrain Rodriguez/**8523	10:47	11:17	30	2.0	60	1.5	1.911	0.012
P120402	12/4/23	PS/ Efrain Rodriguez/**8523	11:18	11:35	17	2.0	34	1	1.274	0.014
P120403	12/4/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/4/2023	Received By:	Oluwaseun Olalekan	Date:	12/4/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

OSHA AIR MONITORING LOG

Project #:	23-274	Date:	12/12/2023 -12/15/2023
Project Name:	Old Medical Building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
P121201	12/12/23	STEL/Maria Mejia/**5826	7:35	8:05	30	2.0	60	1.5	1.911	0.012
P121202	12/12/23	PS/ Maria Mejia/**5826	8:06	15:45	459	2.0	918	1	3.8	0.002
P121203	12/12/23	Blank								
P121301	12/13/23	STEL/Refugio Rodriguez/**8676	7:30	8:00	30	2.0	60	2.0	2.5	0.016
P121302	12/13/23	STEL/Refugio Rodriguez/**8676	8:01	15:50	469	2.0	938	3.5	4.5	0.002
P121303	12/13/23	Blank								
P121401	12/14/23	STEL/Efrain Rodriguez/**8523	7:40	8:10	30	2.0	60	2.0	2.5	0.016
P121402	12/14/23	PS/Efrain Rodriguez/**8523	8:11	15:55	464	2.0	928	4.0	5.1	0.002
P121403	12/14/23	Blank								

P121501	12/15/23	STEL/Jose Alfaro/***8543	7:35	8:05	30	2.0	60	1.5	1.9	0.012
P121502	12/15/23	PS/Jose Alfaro/***8543	8:06	15:50	464	2.0	928	3.0	3.8	0.002
P121503	12/15/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/12/2023	Received By:	Oluwaseun Olalekan	Date:	12/15/2023
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SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA’s

OSHA AIR MONITORING LOG

Project #:	23-274	Date:	12/18/2023 -12/30/2023
Project Name:	Old Medical Building	Type of Analysis:	PCM
Location:	1207 Oak Street, La Marque, TX 77568	Turn Around:	24 Hours
Client Company:	Galveston County	Client Contact:	
Technician:	Oluwaseun Olalekan	TDSHS Lic. #:	706983

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm²)	FIBER CONCENTRATION (f/cc)
P121901	12/19/23	STEL/ Refugio Rodriguez/**8676	10:45	8:15	30	2.0	60	2.5	3.2	0.02
P121902	12/19/23	PS/ Refugio Rodriguez/**8676	8:16	15:45	449	2.0	898	4.5	5.7	0.002
P121903	12/19/23	Blank								
P122001	12/20/23	STEL/ Maria Mejia/**5826	7:35	8:05	30	2.0	60	2.0	2.5	0.016
P122002	12/20/23	STEL/ Maria Mejia/**5826	8:06	15:50	464	2.0	928	5.0	6.4	0.003
P122003	12/20/23	Blank								
P122601	12/26/23	STEL/Efrain Rodriguez/**8523	7:35	8:05	30	2.0	60	1.5	1.9	0.012
P122602	12/26/23	PS/Efrain Rodriguez/**8523	8:06	15:50	464	2.0	928	4.0	5.1	0.002
P122603	12/26/23	Blank								

P122701	12/27/23	STEL/Jose Alfaro/**8543	7:35	8:05	30	2.0	60	2.0	2.5	0.016
P122702	12/27/23	PS/Jose Alfaro/**8543	8:06	15:55	469	2.0	938	4.0	5.1	0.002
P122703	12/27/23	Blank								
P122801	12/28/23	STEL/Saul Vasquez Mejia/**9624	7:25	7:55	30	2.0	60	2.5	3.2	0.02
P122802	12/28/23	PS/ Saul Vasquez Mejia/**9624	7:56	15:45	469	2.0	938	5.0	6.4	0.003
P122803	12/28/23	Blank								
P122901	12/29/23	STEL/ Refugio Rodriguez/**8676	7:40	8:10	30	2.0	60	1.5	1.9	0.012
P122902	12/29/23	PS/ Refugio Rodriguez/**8676	8:11	11:05	174	2.0	348	3.0	3.8	0.004
P122903	12/29/23	Blank								
P123001	12/30/23	STEL/Efrain Rodriguez/**8523	7:32	8:02	30	2.0	60	1.5	1.9	0.012
P123002	12/30/23	PS/Efrain Rodriguez/**8523	8:03	11:02	179	2.0	358	2.5	3.2	0.003
P123003	12/30/23	Blank								

Relinquished By:	Oluwaseun Olalekan	Date:	12/18/2023	Received By:	Oluwaseun Olalekan	Date:	12/30/2023
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**A
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**SETX Environmental, Inc. – Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA's**

ASBESTOS AIR MONITORING LOG

Project #:	23 - 274	Date:	1-4-24
Project Name:	Asbestos Air Monitoring	Type of Analysis:	PCM
Location:	1207 S. Oak St La Marque TX 77568	Turn Around:	
Client Company:	Galveston County	Client Contact:	Lajuan Harris
Technician:	Justin Heisner	TDSHS Lic. #:	N/A

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm ³)	FIBER CONCENTRATION (f/cc)
01/7626	1-4-24	Upwind - SE side portico	8:36	11:30	174	2	348	0.16	14.65	0.016
02/7748		Downwind - SW side portico	8:32	11:31	179	2	358	0.33	42.04	0.045
03/7675		STEL - Felix Molina 4863	8:40	9:10	30	1.75	52.5	0.09	11.46	0.084
04/7836		Personal - Felix Molina 4863	9:11	11:29	138	1.75	241.5	0.39	49.68	0.079
05/7653		Upwind - SE side portico	12:49	16:31	222	2	444	0.17	21.66	0.019
06/7666		Downwind - SW side portico	12:50	16:32	222	2	444	0.29	36.94	0.032
07/7641	✓	Personal - Felix Molina 4863	12:49	16:31	222	1	222	0.32	40.76	0.071

Relinquished By:	Date:	Received By:	Date:
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**A
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**SETX Environmental, Inc. - Environmental Consulting & Testing
Asbestos - Mold - Lead - ESA's**

ASBESTOS AIR MONITORING LOG

Project #:	23-274	Date:	1-5-24
Project Name:	Asbestos Air Monitoring	Type of Analysis:	PCM
Location:	1207 S. Oak St La Marque TX 77568	Turn Around:	
Client Company:	Galveston County	Client Contact:	Lajuan Harris
Technician:	Justin Heisner	TDSHS Lic. #:	N/A

SAMPLE NUMBER	DATE	JOB/SAMPLE DESCRIPTION OR NAME & SS# OR LOCATION	TIME ON	END TIME	TOTAL TIME (MIN)	FLOW RATE (LPM)	VOLUME (L)	FIBER COUNT (f/fields)	FIBER DENSITY (f/mm ³)	FIBER CONCENTRATION (f/cc)
08/7853	1-5-24	Downwind - SE side Portico	11:25	16:40	315	1.8	567	0.61	77.71	0.053
09/7658		Upwind - SW side Portico	11:24	16:41	317	2	634	0.23	29.30	0.018
10/7820		Felix - Personal 4863	11:24	15:28	244	1	244	0.36	45.86	0.072
11/7823	↓	Felix - Excursion 4863	15:28	15:58	30	1	30	0.05	6.37	0.082

Relinquished By:	Date:	Received By:	Date:
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Texas Department of State Health Services

SETX ENVIRONMENTAL INC DBA
ASE SERVICES

is certified to perform as an

Asbestos Consultant Agency

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.



License Number: 100491

Expiration Date: 10/25/2024

Control Number: 97520

Jennifer Shuford, MD
Jennifer Shuford, MD, MPH,
Commissioner of Health

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

SEE BACK



Texas Department of State Health Services

SETX ENVIRONMENTAL INC DBA
ASE SERVICES

is certified to perform as an

Asbestos Laboratory

PCM

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.



License Number: 300432

Expiration Date: 10/04/2025

Control Number: 96735

Jennifer Shuford, MD
Jennifer Shuford, MD, MPH,
Commissioner of Health

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

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SETX Environmental, Inc.
Environmental Consulting & Testing
Asbestos - Mold – Lead – ESA's

Mr. Mark Garcia
Galveston County
722 Moody Avenue
Galveston, TX 77550

December 11, 2023
ASE Project No. 23-274

Re: Limited Asbestos Survey – Exterior Suspect Materials
Site: 1207 S. Oak Street, La Marque, TX 77568

SETX Environmental, Inc. (ASE), Texas Department of State Health Services (TDSHS) Licensed Consultant Agency (License No. 100491), has conducted an asbestos survey at the above-referenced site of suspected Asbestos Containing Building Materials (ACBM) to be demolished or involved in renovations. This survey was performed in compliance with The Texas Asbestos Health Protection Rules (TAHPR) and the National Emissions Standards for Hazardous Air pollutants (NESHAP). This survey also satisfies the requirements of Senate Bill 509, which requires cities to verify an Asbestos Survey has been performed prior to issuing a Permit for Renovation, Demolition, Occupancy, etc. Mr. David Morton, TDSHS Asbestos Inspector, License No. 603600, conducted the survey. The survey was initiated and completed on December 8, 2023. Eighteen (18) samples were collected and delivered to Apex Precision Analytical Services, Inc., TDSHS Lab License No. 30-0312, for analysis by Polarized Light Microscopy (PLM).

The results of the surveys must be kept on site during renovation or demolition activities.

This survey did include destructive sampling; however, it is still limited in scope. All suspect materials may not have been identified or sampled (hidden under carpet, in wall cavities, mirror mastic, or moisture barriers, etc.).

When renovations or demolition occurs, this survey should be reviewed to determine if additional sampling is required for those materials to be disturbed.

With regard to asbestos, a homogeneous area (an area of material that is uniform in color and texture) shall be determined to contain asbestos if the results of at least one sample collected from it indicate that asbestos is present in an amount of or greater than one percent (1%). Once a material has been found to contain asbestos, all such materials in the homogeneous area are considered to contain asbestos. A minimum of three (3) samples of each suspect material must be collected and analyzed in order to comply with the requirements of the **TAHPR Regulations**.

Building materials that contain asbestos and are in public buildings, commercial buildings, or facilities and which are in good condition can be managed under a Management Plan and an Operations and Maintenance (O&M) program. An O&M spells out the procedures and practices that must be applied to building cleaning, maintenance, renovation, and general operation to maintain the building as free of asbestos contamination as possible. The O&M would remain in effect until all ACM have been removed from the property for which it was prepared.

Prior to beginning asbestos abatement activities, notification must be sent to the TDSHS at least ten working days prior to the start of the work. A TDSHS licensed Asbestos Consultant must be engaged to prepare the specifications and conduct the project management and air monitoring activities during the abatement project and for final clearance.

Based on the Laboratory Analysis, Asbestos HAS BEEN identified in a portion of the bulk samples below. (see BOLDED entries)

Sample Analysis Summary

Sample No.	Material & Location	Asbestos Content
01-274	Plaster Ceiling and Columns – Front Overhang, Ceiling at Damage	None Detected
02-274	Plaster Ceiling and Columns – Front Overhang, Ceiling at Damage	None Detected
03-274	Plaster Ceiling and Columns – Front Overhang, Southwest Column at Damage	None Detected
04-274	Stucco/EFIS Walls – West Side near Mechanical Room	None Detected
05-274	Stucco/EFIS Walls – South Side at Southeast Corner	None Detected
06-274	Stucco/EFIS Walls – East Side at Middle	None Detected
07-274	Gypsum Board behind Stucco/EFIS Walls – West Side near Mechanical Room	None Detected
08-274	Gypsum Board behind Stucco/EFIS Walls – South Side at Southeast Corner	None Detected
09-274	Gypsum Board behind Stucco/EFIS Walls – East Side at Middle	None Detected
10-274	Window/Door Frame Caulk – West Side of Front Door	None Detected
11-274	Window/Door Frame Caulk – East Side of Front Windows	None Detected
12-274	Window/Door Frame Caulk – East Side Windows at Middle Door	None Detected
13-274	Black Mastic Vapor Barrier behind Brick Walls – East Side, Southeast Corner	None Detected
14-274	Black Mastic Vapor Barrier behind Brick Walls – East Side, Southeast Corner	None Detected
15-274	Black Mastic Vapor Barrier behind Brick Walls – East Side, Southeast Corner	None Detected
16-274	Transite/Fiberboard Wall – Interior – West Side Old Exterior Wall Near Room #13	Transite – Chrysotile 60%
17-274	Transite/Fiberboard Wall – Interior – West Side Old Exterior Wall Near Room #13	Transite – Chrysotile 60%
18-274	Transite/Fiberboard Wall – Interior – West Side Old Exterior Wall Near Room #13	Transite – Chrysotile 60%

The conclusions in an environmental consulting report are based on the findings of the investigation described in an industry accepted or specified scope. An assessment cannot absolutely conclude that a site does not contain hazardous materials inside structures or on its surface or subsurface or any such materials have not impacted the condition of the site.

As long as the assessment is conducted properly and within standards and/or regulations, and all due considerations are made, a degree of assurance can be achieved. The degree of assurance is determined by the amount of available information, scope of the assessment, and complexity of analyses performed. An absolute warranty cannot be expressed or implied that no environmental liabilities exist on the site.

Please contact me if you have any questions or if we can be of further assistance regarding this survey or other environmental issues.

Respectfully:



Jerry G. Sonier
President
ASE Services

Respectfully:



David Morton
Asbestos Inspector
TDSHS License No. 603600

Attached:
Sample Locations (COC)
Laboratory Analysis
Company Licensing

CC: Job File



SETX Environmental, Inc.
dba ASE Services
Environmental Consulting & Testing
Asbestos - Mold - Lead - ESA's

Bulk Sample Log

5223-5143

Project #:	23-274	Date:	12-8-23
Project Name:	1207 S. Oak St. - Exterior Suspect Materials		
Location:	1207 S Oak St., La Marque, TX		
Inspector:	David Morton	TDSHS Lic. #	603100
Accompanied By:	N/A		
Turn Around Time:	24-hr.		

Sample#	Material Sampled	Location Sampled	Asbestos %
01 -	Plaster Ceiling + Columns	Front Overhang Ceiling at Damage	
02 -	↓ ↓	↓ ↓	
03 -	↓ ↓	↓ SW Column at Damage	
04 -	Stucco/EFIS Walls	West side near mechanical room	
05 -	↓ ↓	South side at SE corner	
06 -	↓ ↓	East side at middle	
07 -	Gypsum Board behind Stucco/EFIS Walls	West side near mechanical room	
08 -	↓ ↓ ↓	South side at SE corner	
09 -	↓ ↓ ↓	East side at middle	
10 -	Window / Door Frame caulk	West side of front door	
11 -	↓ ↓	East side of front windows	
12 -	↓ ↓	East side windows at middle door	
13 -	Black mastic vapor barrier behind Brick walls	East Side Southeast corner	
14 -	↓ ↓ ↓ ↓ ↓		
15 -	↓ ↓ ↓ ↓ ↓		
16 -	Transite / Fiberboard wall	Interior - West side old exterior wall near room # 13	
17 -	↓ ↓ ↓ ↓ ↓		
18 -	↓ ↓ ↓ ↓ ↓		

Relinquished by:		Date:	12-8-23	Received by:		Date:	12/8/23
							1430

ASBESTOS BULK ANALYSIS REPORT

Date: December 11, 2023

ASE Services

Report: 5223-5143
23-274 / Exterior Suspect Material / 1207 S.
Oak St., La Marque, TX

This document shall be considered a duly signed original report of the results obtained from the analysis(es) performed. All analyses are done within government guidelines and regulations.

A handwritten signature in black ink, appearing to read 'G.R. Simmons', is positioned above a horizontal line.

Gary R. Simmons
Laboratory Manager

Lab Comments on Project: N/A

PLM (Bulk) - Asbestos Analysis Report - Visual ID

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials and EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

ASE Services
 3331 Taft Ave.
 Groves, TX 77619
 409-963-2731
 Contact: Jerry Sonier

Report Number: 5223-5143
Report Date: December 11, 2023
Samples Collected: December 8, 2023
Date Received: December 8, 2023
Turn-around time: 24 Hour

Job ID / Site: 23-274 / Exterior Suspect Material / 1207 S. Oak St., La Marque, TX

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
01	5223-5143-01	White,Grey / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
02	5223-5143-02	White,Grey / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
03	5223-5143-03	White,Grey / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
04	5223-5143-04	Yellow,Grey,White / Material / Fibrous / Homogeneous	None Detected	Fibrous Glass 5%	Binder
05	5223-5143-05	Yellow,Grey,White / Material / Fibrous / Homogeneous	None Detected	Fibrous Glass 5%	Binder
06	5223-5143-06	Yellow,Grey,White / Material / Fibrous / Homogeneous	None Detected	Fibrous Glass 5%	Binder
07	5223-5143-07	Brown / Gypsum Board / Fibrous / Homogeneous	None Detected	Cellulose 10% Fibrous Glass 2%	Binder
08	5223-5143-08	Brown / Gypsum Board / Fibrous / Homogeneous	None Detected	Cellulose 10% Fibrous Glass 2%	Binder
09	5223-5143-09	Brown / Gypsum Board / Fibrous / Homogeneous	None Detected	Cellulose 10% Fibrous Glass 2%	Binder
10	5223-5143-10	Brown / Caulking / NonFibrous / Homogeneous	None Detected	None Detected	Binder

Analytical results and reports are generated by Apex Precision Analytical Services at the request of and for the exclusive use of the person or entity (client) named on such report. Result, reports or copies of same will not be released by Apex Precision Analytical Services to any third party without the written request from client. These results only represent the materials submitted. Supporting laboratory documentation is available upon request. This report cannot be used to represent conditions at any other location, date or time and does not imply that this space is free from these or any other contaminants. No responsibility or liability is assumed for the manner in which these results are used or interpreted. This must not be used to claim product endorsement by NVLAP or any government agency of the United States. Apex Precision Analytical Services reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified.

PLM (Bulk) - Asbestos Analysis Report - Visual ID

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11	5223-5143-11	Brown / Caulking / NonFibrous / Homogeneous	None Detected	None Detected	Binder
12	5223-5143-12	Brown / Caulking / NonFibrous / Homogeneous	None Detected	None Detected	Binder
13	5223-5143-13	Black / Vapor Barrier / NonFibrous / Homogeneous	None Detected	None Detected	Binder
14	5223-5143-14	Black / Vapor Barrier / NonFibrous / Homogeneous	None Detected	None Detected	Binder
15	5223-5143-15	Black / Vapor Barrier / NonFibrous / Homogeneous	None Detected	None Detected	Binder
16	5223-5143-16A	Light Grey / Material / Fibrous / Homogeneous	Chrysotile 60%	None Detected	Binder
	5223-5143-16B	Brown / Material / Fibrous / Homogeneous	None Detected	Cellulose 80%	Binder
17	5223-5143-17A	Light Grey / Material / Fibrous / Homogeneous	Chrysotile 60%	None Detected	Binder
	5223-5143-17B	Brown / Material / Fibrous / Homogeneous	None Detected	Cellulose 80%	Binder
18	5223-5143-18A	Light Grey / Material / Fibrous / Homogeneous	Chrysotile 60%	None Detected	Binder

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Texas Department of State Health Services

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ASE SERVICES

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Asbestos Consultant Agency

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License Number: 100491

Expiration Date: 10/25/2024

Control Number: 97520

Jennifer Shuford, MD
Jennifer Shuford, MD, MPH,
Commissioner of Health

(Void After Expiration Date)

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