

PLAN HOLDER REGISTRATION FORM / TERMS & CONDITIONS

Invitation for Bid Proposals (IFP)

Starr County Courthouse Temporary Housing Interior Build-Out

It is the responsibility of all persons who download bid documents to REGISTER as a Plan Holder with Starr County, Texas. Registered Plan Holders will be advised via email or other means of all IFP Amendments that are issued, and all Amendments will be available for downloading at the Starr County website: www.co.starr.tx.us, Link: Starr County Courthouse Temporary Housing Interior Build-Out Project. A bidder's failure to acknowledge receipt of an IFP Amendment (see IFP Section 00 21 16, Instructions to Bidders) may result in rejection of the sealed bid proposal.

TO REGISTER, please fill out the information below (all fields are mandatory) and submit the form via FAX to 956-716-8181 (Attention: Maricella Ibarra, Contracting Officer)

-- or --

Scan and EMAIL completed form to the following email address:
mibarra@co.starr.tx.us

SIGNATURE (Contact Person listed below): _____

Company Name: _____

Contact Person/Title: _____

Mailing Address: _____

Physical Address: _____

Office Phone: _____ Mobile: _____ FAX: _____

Email Address: _____

Bid documents for this project may be downloaded from this site, for bidding purposes only, if the User agrees, without exception, to the following terms and conditions:

The User agrees that electronic media documents downloaded from this site are for the User's use in preparing their bid and are offered as a convenience to the User. Use of these materials for any other purpose shall be without liability to Starr County, Texas, and its consultants. The User acknowledges and agrees that Starr County's instruments of service are the printed hard copy (as amended) of the Invitation for Bids issued for the respective project as available for viewing at the Starr County, Texas, Annex (Suite 220). In the event of a conflict in their contents, the printed hard copy shall take precedence over the electronic media. Starr County's electronic media are furnished without guarantee of compatibility with the bidder's software or hardware. It is the User's responsibility to determine/evaluate the capability of their equipment to provide documents that are accurate for size, scale, and content.

If the User elects to only download partial information (selected sheets of the drawings or pages of the specifications), they shall be responsible for obtaining all pertinent bidding information to adequately and accurately prepare their bid proposal. The User is responsible for including in their proposal all of the Required Bid Information as specified in IFB PART I, Subpart B, Instruction to Bidders #3.

The User agrees to indemnify, defend, and hold harmless Starr County, Texas, their consultants, and the officers and employees and any of them from and against any and all claims, suits, losses, damages, or costs, including attorney's fees, arising from or by reason of the User's use of these electronic media documents.



INVITATION FOR BID PROPOSALS

December 4, 2025

Starr County Courthouse

Temporary Housing Interior Build-Out

Rio Grande City, Texas

Contracting Local Organization

Starr County Commissioners' Court

Rio Grande City, Texas



SPECIFICATIONS

STARR COUNTY

Starr County Courthouse
Temporary Housing
Interior Build-Out

Milnet Architectural Services, PLLC

608 S. 12th Street
McAllen, Texas 78501

Phone: 956-688-5656

Fax: 956-687-9289

Website: www.milnet-archs.com

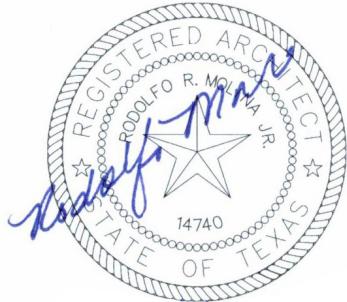
Project No. 224026
Set No:

STARR COUNTY
COURTHOUSE TEMPORARY HOUSING
INTERIOR BUILD-OUT

PROJECT MANUAL

MAS Project No. 224026 Plans and Specifications

**Starr County Courthouse Temporary Housing
Interior Build-Out
Rio Grande City, Texas 78582**



12/04/2025

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
333 Guadalupe, Suite 2-350, AUSTIN, TX 78701-3942
(Tel: 512/305-9000)
HAS JURISDICTION OVER INDIVIDUALS LICENSED UNDER
THE ARCHITECT'S REGISTRATION LAW
ARTICLE 249a, VERNON'S CIVIL STATUTES".

MILNET ARCHITECTURAL SERVICES, PLLC
608 S. 12th St.
McALLEN, TEXAS 78501
(956) 688-5656 - FAX (956) 687-9289

The County of Starr
Starr County Courthouse Temporary Housing Interior Build-Out
1920 US-83, Rio Grande City, Texas 78582
MAS Project No. 224026

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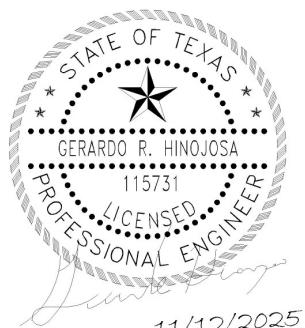
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- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

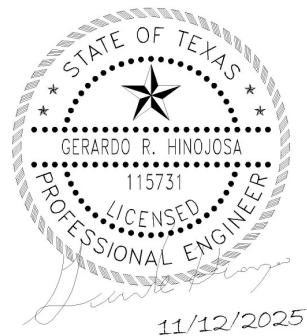
26 2000 L O W (LINE) V O L T A G E D I S T R I B U T I O N

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SECTION 00 11 00 — ADVERTISEMENT AND INVITATION

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION:

8,460 sq. ft. interior build-out of the former Zarsky Lumber Yard Company Hardware store located at 1920 US-83 in Rio Grande City, TX, to provide temporary housing for the Starr County Courthouse. The temporary courthouse will include two courtrooms with holding cells, office spaces for the county judges and staff, and additional required bathroom facilities. The scope of work includes, but is not limited to, demolishing the existing interior finishes and building out the space with new interior walls and finishes, along with minor exterior upgrades. The project will also include mechanical, electrical, plumbing, and other necessary improvements.

A. Refer to Section 00 21 16 – Instructions to Proposers.

1.2 PRE-PROPOSAL CONFERENCE:

A. The purpose of the Pre-Proposal Conference is to answer any questions that any bidder may have. The deadline for question submissions is Friday, November 21, 2025 at 5pm. All questions must be asked in writing and directed to Rudy Molina, AIA, Milnet Architectural Services, 608 S. 12th St., McAllen, Texas 78501 / (956) 688-5656 Phone – (956) 687-9289 Fax, rudym@milnet-archs.com. All questions will be answered in a written addendum only.

B. Date and Time: Thursday, November 20, 2025 @ 10:00 A.M.

C. Location: Starr County Annex Conference Room, Suite 211
100 N. FM 3167, Suite 220, Rio Grande City, TX 78582

1.3 OPENING OF PROPOSALS:

A. Place:

1. Competitive sealed proposals will be received at the office of :

Owner: The County of Starr
Address: 100 N. FM 3167, Suite 202, Rio Grande City, TX. 78582 (County Judge's Office)
Attention: Maricela G. Ibarra
Director for Starr County Federal and State Programs

B. Date: **Thursday, December 4, 2025**

C. Hour: **3:00 P.M.**

1.4 REJECTION:

A. The Owner reserves the right to reject any or all Proposals, and to waive any irregularities or formalities.

END OF SECTION

SECTION 00 11 19 - REQUEST FOR COMPETITIVE SEALED PROPOSALS

PROJECT: Starr County Courthouse Temporary Housing Interior Build-Out

OWNER: The County of Starr
401 Britton Ave.
Rio Grande City, Texas 78582
(956) 716-4800ARCHITECT: Milnet Architectural Services
608 South 12th Street
McAllen, Texas 78501RFCSP DEADLINE: **Thursday, December 4, 2025 @ 3:00 p.m.**

INVITATION: Your firm is invited to submit Competitive Sealed Proposals to the Owner, at 100 N. FM 3167, Suite 202, Rio Grande City, TX. 78582 (County Judge's Office) for the work described above, on or before the RFCSP deadline indicated above.

PRE-PROPOSAL CONFERENCE: A pre-bid conference will be held at 10:00 a.m. local time on Thursday, November 20, 2025, in the Starr County Annex Conference Room, Suite 211. A site showing of the project site will follow the conference. The deadline for question submissions is Friday, November 21, 2025, at 5 pm. All contractors proposing to submit competitive sealed proposals on this project are strongly encouraged to attend.

INSPECTION OF SITE: The site is also accessible for inspection at other times upon notification to Maricela G. Ibarra, Director for Starr County Federal and State Programs, at (956) 716-4800. Proposers are encouraged to visit the site and assess existing conditions.

PROPOSAL DOCUMENTS: Invitation for Proposals (IFP) documents will be available electronically beginning Wednesday, November 12th, 2025. Complete IFP documents and a Plan Holders Registration Form/Terms & Conditions may be viewed and downloaded at no charge from the Starr County website: www.co.starr.tx.us – click on Invitation for Bids or “Starr County Courthouse Temporary Housing Interior Build-Out”. Contact Abel Barrera (956-716-4800) if you have problems downloading documents. Electronic copies of the Bid/Contract Documents may also be obtained by emailing a request to rudym@milnet-archs.com. No printed copies of the IFP will be distributed to interested parties, but a printed copy is available for viewing at the Starr County Annex, 100 N. FM 3167, Suite 220, Rio Grande City, TX 78582.

PROPOSAL SECURITY: Proposers will be required to provide Proposal Security in the form of a Proposal Bond in the amount of 5 percent of the largest possible total proposal, including consideration of alternates, with each proposal. A Proposal Bond shall be issued by a Surety acceptable to the Owner and meeting the requirements of General Conditions of the Contract for Construction. Proposal Bonds shall be prepared on forms meeting all the requirements of applicable State of Texas statutes. Proposal Bonds shall be issued on forms acceptable to the Owner and shall include, as a minimum standard, the information, requirements, and standard illustrated by AIA Document A310, latest revised edition available. Failure to provide the Proposal Bond with the proposal will constitute a non-responsive proposal and the proposal will not be considered.

PERFORMANCE AND LABOR AND MATERIAL PAYMENT BONDS: The successful offeror will be required to provide 100% Performance and Labor and Materials Payment Bonds in strict conformance with all the requirements of the Contract Documents. Failure to do so will result in cancellation of the contract award and forfeiture of the Proposal Bond security as liquidated damages.

PROPOSAL WITHDRAWAL: Proposals will be required to be submitted under a condition of irrevocability for a period of 60 days after submission. No proposal may be withdrawn for a period of 60 days.

OWNER'S RIGHT OF REJECTION: The Owner reserves the right to accept or reject any or all offers (competitive sealed proposals).

SECTION 00 21 16 — INSTRUCTIONS TO PROPOSERS

PART 1 - GENERAL

1.1 SECURITY BOND:

- A. Security bond in the amount of five (5%) of the Proposal must accompany each Proposal. Security bond shall be issued by an insurance company authorized to provide bonds on work in the State of Texas and shall be payable to the Owner.

1.2 DOCUMENTS:

- A. Complete sets of Construction Documents shall be used in preparing proposals; neither the Owner nor the Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Construction Documents.
- B. Complete IFB documents and a Plan Holders Registration Form/Terms & Conditions may be viewed and downloaded at no charge from the Starr County website: www.co.starr.tx.us – click on Invitation for Bids or “Starr County Courthouse Temporary Housing Interior Build-Out”. Contact Abel Barrera (956-716-4800) if you have problems downloading documents.
- C. Electronic copies of the Bid/Contract Documents may also be obtained by emailing a request to rudym@milnet-archsolutions.com.
- D. The Owner or Architect, in providing electronic copies of the Construction Documents available on the above terms, does so only for the purpose of obtaining proposals on the work and does not confer a license or grant for any other use.
- E. Complete sets of Drawings and Project Manuals are on file at the following locations, and subcontractors may examine them there:

-Starr County Annex, 100 N. FM 3167, Suite 220, Rio Grande City, TX 78582

1.3 EXAMINATION:

- A. Offerors shall carefully examine the Construction Documents and the construction site to familiarize themselves with existing local conditions under which the Work is to be performed.
- B. Extra payments will not be authorized for work that could have been foreseen by careful examination of the site. Submission of a proposal shall constitute acceptance, by the offeror, of existing site conditions ***work in and around the existing property site*** as a part of the requirements for this work.
- C. Offerors shall carefully examine the Construction Documents to verify that they agree with the Table of Contents in the Project Manual, the Index of Drawings Sheet on the Drawings, and the Cover Page of all Addenda. Offerors shall be responsible for obtaining any pages or sheets that have been inadvertently left out during the printing process.
 - 1. All entities providing proposals on any portion of the work contained in the Construction Documents shall ascertain the completeness of the set of documents.

2. The Construction Documents are printed by an independent vendor and, although the Architect endeavors to check the documents for completeness, the Architect has, in the past, discovered missing or misplaced sheets in the Drawings and the Specifications.
3. Each entity receiving a set of Construction Documents shall check the indexes against the sheets or pages contained in the sets.
4. Should pages or sheets be found to be misplaced or missing, immediately notify the Architect who will give direction as to placement or provide the sheets or pages that are missing.
5. Failure to notify the Architect means the offeror is providing a proposal based on a complete set of Construction Documents.

1.4 INTERPRETATION OF CONSTRUCTION DOCUMENTS:

- A. Offerors shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Construction Documents or of the site and local conditions.
- B. **Do not dimension the drawings. Any dimensions or questions should be directed to the Architect.**
- C. Submit all questions regarding clarification or interpretation of Construction Documents to the Office of the Architects: ***MILNET ARCHITECTURAL SERVICES 608 S. 12TH ST., (attn: Rudy Molina, Jr.) AIA-(956) 688-5656; FAX NUMBER (956) 687-9289.***
- D. Submit all questions in writing. In the interest of time, requests may be made by telephone, but they must be confirmed in writing the same day. Replies to questions will be issued to all Offerors in the form of an Addenda. General contractors and subcontractors shall submit questions in writing forty-eight (48) hours prior to the opening of proposals.
- E. Make requests for interpretations as early as possible so as to allow adequate time to prepare and issue Addenda.
- F. All Offerors shall check with the Architect within ***six (6) hours*** prior to the opening of proposals to secure all Addenda. The Architect will not be responsible for oral clarification.

1.05 BASIS OF PROPOSALS:

- A. Proposals shall be on a lump sum basis for each and or combined proposal packages and shall include all costs for these projects as described and indicated by the Construction Documents. Basis for proposals shall be on brands, materials, processes, products, persons or organizations, etc.,
- B. Proposals shall include all unit price costs and all Alternate costs as indicated by the Construction Documents and Proposal Form.

1.06 ALTERNATES:

- A. The Owner may, at his option, elect to proceed with any or all Alternates as set forth in the Contract Requirements.
- B. Amount shown in proposal for each Alternate shall include profit, insurance, contingencies and other costs incidental to performance under such Alternative.
- C. Amount shown in Proposal for each Alternate shall include the making of all changes and the installation of all materials and equipment necessary to the accomplishment of the Alternate requirements.

1.07 PROPOSALS:

- A. Proposals shall be made on unaltered Proposal Forms furnished by the Architect. No oral, telephone or personal Proposals will be considered. All blank spaces shall be properly filled in by typewriter or manually in ink.
- B. Where so indicated by the makeup of the Proposal Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.
- C. Any alteration or erasure to information entered in the blank spaces must be initialed by the signer of the proposal.
- D. Original typed sheets shall be submitted, signed in longhand below the typed name of the person authorized to bind the offeror to a Contract.
- E. Where the offeror is a corporation, the Proposal must be signed with the legal name of the corporation, followed by the name of the State of Incorporation and the legal signature of a person authorized to bind the corporation to a Contract.
- F. Failure to submit a proposal on the form requested, or the inclusion of conditions, limitations or provisions distorting the intent of the Construction Documents, will render the proposal irregular and subject to rejection.

1.08 SUBMITTALS:

- A. Submit Proposal, Security Bond and other required data in an opaque, sealed envelope. Submit proposal at the time and place shown in the Notice for competitive Sealed Proposals.
- B. Envelope shall be addressed to the Owner and identified with the Project Name and the name and address of the offeror.
- C. If the Proposal is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "PROPOSAL ENCLOSED" on the face thereof. No envelopes shall be opened until the date and time set for proposals to be received.

1.09 MODIFICATION OR WITHDRAWAL OF PROPOSAL:

- A. A proposal may not be withdrawn or canceled by the offeror during the stipulated time period following the time and date designated for the receipt of Proposals, unless the award of Contract has been delayed more than sixty (60) days.
- B. Prior to the time and date designated for receipt of Proposals, Proposals submitted early may be modified or withdrawn only by notice to the party receiving Proposals at the place and prior to the time designated for receipt of Proposals.
- C. Modification of Proposals shall be in writing over the signature of the offeror or be by telegram; if by telegram, written confirmation over the signature of the offeror must have been mailed and postmarked on or before the date and time set for receipt of proposals; it shall be so worded as not to reveal the amount of the original Proposal.
- D. Withdrawn Proposal may be resubmitted up to the time designated for the receipt of proposals, provided that they are then fully in conformance with these Proposal Instructions.
- D. Security bond shall be in an amount sufficient for the proposal as modified or resubmitted.

1.10 CONSIDERATION OF PROPOSAL:

- A. Properly identified Proposals received on time will be considered.
- B. The Owner shall have the right to reject any or all Proposal and in particular to reject a Proposal not accompanied by any required security bond or data required by the Contract Documents or a Proposal in any way incomplete or irregular.
- C. The Owner shall have the right to waive any formality or irregularity in any proposal received.
- D. If the Owner accepts any Alternates, he shall have the right to accept them in any order or combination.
- E. It is the intent of the Owner to award a contract to the offeror submitting the proposal providing the “best value” to the Owner provided the Proposal has been submitted in accordance with the requirements of the Contract Documents, selection criteria and adopted by the Owner.

1.11 LOCATION AND ACCESS TO PREMISES:

- A. The project site location: Refer to Vicinity Drawings.
- B. The offeror shall have free access to the premises for the purpose of acquainting himself with the conditions, delivering equipment, and performing the work necessary to fulfill the contract with prior notice to Starr County officers. Offeror shall cooperate with the other contractors who may concurrently be working on the premises, integrating his work with that of others, all to the best interest of the total work and its orderly completion.

1.12 STATE SALES TAX:

- A. This project is exempt from state taxes. A sales tax exemption certificate may be obtained from the State Comptroller.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 00 25 16 — PRE-PROPOSAL MEETING

PART 1 - GENERAL

1.1 SITE INSPECTION:

- A. A site inspection to obtain a clear understanding of the project requirements is strongly encouraged but attendance remains at the proposers' discretion; however, site access is restricted. This will be the proposer's only opportunity to inspect the site prior to the Proposal Deadline Date.

1.2 PRE-PROPOSAL MEETING:

- A. A pre-proposal meeting will be held at the time and place specified below for the purpose of answering any questions that any proposer may have. This meeting will provide proposers an opportunity to familiarize themselves with the existing conditions. All prime contractors and major subcontractors are strongly advised to attend. Others are invited to attend.
- B. Date and Time: Thursday, November 20, 2025 @ 10:00 A.M.
- C. Location: Starr County Annex Conference Room, Suite 211
100 N. FM 3167, Rio Grande City, Texas 78582

END OF SECTION

SECTION 00 42 00 — PROPOSAL FORM FOR COMPETITIVE SEALED PROPOSALS

RE: Starr County Temporary Housing Interior Build-Out

ATTN: Maricela G. Ibarra, Director
Starr County Federal and State Programs
100 N. FM 3167, Suite 220, Rio Grande City, Texas 78582

PART 1 - The Undersigned proposes to furnish all labor, services, materials, tools, and necessary equipment for the Starr County Courthouse Temporary Housing Interior Build-Out project (1920 US-83, Rio Grande City, Texas 78582) and to perform the work required for the construction of said project at the location set out by the Drawings, Project Manual and Specifications, in strict accordance with the Contract Documents for the complete work.

In submitting this Proposal, it is understood that this Proposal may not be altered or withdrawn for sixty {60} days from submission date and that the Owner has reserved the right to reject any and all Proposals.

The Undersigned certifies that this Proposal is made in good faith, without collusion or connection with any other person, persons, partnership, company, firm, association, or corporation offering on this work, for the following sum or prices to wit:

PART 2 - BASE PROPOSAL:

\$ _____ (Base proposal number)

\$ _____ (Base proposal words)

_____ (Base proposal words)

PART 3 - ALLOWANCE:

\$ 90,000.00 (Allowance number)

\$ Ninety Thousand Dollars (Allowance words)

_____ (Allowance words)

TOTAL:

\$ _____ (TOTAL number)

\$ _____ (TOTAL words)

_____ (TOTAL words)

The Undersigned hereby declares that he has visited the site and has carefully examined the Drawings, Specifications, Contract Documents and Proposal Documents related to the Work covered by his proposal.

Upon receipt of "*NOTICE TO PROCEED*", the Undersigned will immediately execute the formal contract (Agreement).

The Undersigned agrees to commence work within ten (10) days of receiving the Notice to Proceed and to substantially complete the work on or before **270 calendar days after Notice to Proceed.**

The Contract required will be that Standard Form of the American Institute of Architects and shall provide for payment on accounts of ***ninety-five (95%)*** percent of the value monthly.

The Proposal, the Agreement, the Drawings, the General Conditions, Supplementary General Conditions, the Specifications and any Addenda shall all become a part of the Contract.

I hereby acknowledge receipt of the following Addendum:

BONDING COMPANY (IES):

(Name and address)

The Undersigned proposes to use the following Subcontractors, Manufacturers, Products, Material Suppliers for the principal portions of the work.

NAME(S) OF SUB-CONTRACTORS:

NAME(S) OF MANUFACTURERS:

NAME(S) OF MATERIAL SUPPLIERS:

Name of Company (Proposer)

Printed Name

Address

Title

City

State

Signature

Telephone

Sworn to and subscribed before me this _____ day of _____, 20____

SEAL

Notary Public in and for the State of Texas

SEAL (If Proposal is By a Corporation) _____

END OF SECTION

SECTION 00 43 00 – RANKING/SELECTION CRITERIA

1.0 Ranking /Selection Criteria

A. The selection of offeror will be based on the following: Ranking/Selection Criteria. The Owner retains the right to apply the selection criteria as allowed in Texas Government Code, Sec. 2269.155.

1. **Monetary Value: 50 Points Max**

Based on Proposals Submitted and Pricing Differential

- 1.1 Base Proposal
- 1.2 Alternate Proposal(s)

2. **Support Information: 50 Points Max**

The following support information shall be submitted in separate sealed envelope attached with proposal. Provide a table of contents and separate each section with divider tabs. *Submit one (1) original and two (2) copies.*

2.1 Reputation / 2 points each – 8 points maximum

- 2.1A Provide contractor's qualification statement form AIA 305 (filled out and signed).
- 2.1B Provide information on company acting as surety on performance and payment bonds.
- 2.1C Provide three (3) letters of recommendation/references from previous clients.
- 2.1D How long has your company been in existence?

2.2 Past experience / 4 points each – 16 points maximum

- 2.2A List all relevant projects for which company has provided services in the past five (5) years. Provide name, telephone number and email address of contact person.
- 2.2B Describe past efforts in working with owner, its agents and design team in resolving construction issues. List a minimum of two (2) examples.
- 2.2C Describe history of providing fair assessment of change order pricing/additional pricing requests and proposed method for detailing cost documentation of these.
- 2.2D For the past five (5) completed projects, list the total number of change orders, additional pricing requests, change proposals/requests that were approved.

2.3 Contractor Personnel / 2 points each – 4 points maximum

- 2.3A Provide resume of proposed project manager, project superintendent and other key personnel. Provide current workload of project manager.
- 2.3B Address History and process for maintaining assigned personnel for the duration of the project.

2.4 Workforce / 4 points each – 4 points maximum

- 2.4A Provide list of work to be performed by contractor's own forces and list of proposed subcontractors. (Include all major trade subcontractors.)

2.5 Times Lines / 4 points each – 8 points maximum

- 2.5A Address history and proposed procedures to adhere to construction schedule from date of notice to proceed to completion of punchlist items.
- 2.5B Address history and procedure of securing contracts between general contractor and its subcontractors/suppliers in a timely manner.

2.6 Financial Strength / 2 points each – 4 points maximum

- 2.6A Provide a bank letter of reference regarding the company's financial strength.
- 2.6B Has the company or company's principals ever filed for bankruptcy?

2.7 Other relevant factors / 6 points maximum

- 2.7A Other relevant factors that the Owner would consider in selecting a general contractor.

END OF SECTION

SECTION 00 52 13 — AGREEMENT FORM - STIPULATED SUM

PART 1 - GENERAL

1.1 AGREEMENT FORM:

- A. The modified “Standard Form of Agreement Between Owner and Contractor where the Basis of Payment is a Stipulated Sum”, AIA Document A101, 2017 Electronic Format Edition, will be the form used as a Contract for this Project.
- B. General Conditions AIA – A201 will be used in this project. See attached
- C. A copy of the Standard AIA Document may be examined at the office of the Architect. Copies may be purchased from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C., 20006.
- D. Modification may be made to the above Agreement & General Conditions A201 form or an Owner provided agreement and general conditions may be utilized. Either of which will be provided to contractor for review upon award of project, for final execution of the contract. See attached.
- E. Section 00 73 00 Supplementary Conditions forms part of this Agreement.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 00 61 00 — PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS: PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND:

- A. The Contractor shall, prior to the execution of the Contract, furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the amount of 100% of the Contract Price covering 100% performance and 100% payment, and with such sureties secured through the contractor's usual sources as may be agreeable to the parties.
- B. The Contractor shall deliver the required bonds to the Owner not later than the date of execution of the Contract, or if the work is commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be finished.
- C. The Contractor shall require the Attorney-In-Fact who executes the required bonds on behalf of the surety to affix thereto a certificate and current copy of his Power of Attorney.
- D. Any Payment Bond and Performance Bond furnished pursuant to the provisions of Art. 5160, Vernon's Texas Civil Statutes, connected with this project, shall be furnished by a corporate surety or corporate or corporate sureties in accordance with Article 7.19-1, Vernon's Texas Insurance Code, that has a stated capital and surplus (as reported by it to the Texas Insurance Commission in its most recent report) that is in excess of ten times the stated amount of the Payment Bond or the Performance Bond. Provided however, that if any Payment Bond or any Performance Bond is in an amount in excess of ten percent (10%) of the surety company's capital and surplus (as reported to the Texas Insurance Commission in its most recent report), as a condition to accepting the bond, the Owner must receive written certification and information, satisfactory in form and substance to the Owner, that the surety company has reinsured the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus, with one or more reinsurers who are duly authorized, accredited or trusted to do business in the State of Texas. For the purpose of this requirement, any amount reinsured by any reinsurer may not exceed ten percent (10%) of the reinsurer's capital and surplus (as reported to the Texas Insurance Commission by the reinsurer in its most recent report). In the event there is one or more reinsurer, the surety company must provide all necessary information and certification related to the current financial condition of the surety company and any and all reinsurers required by the Owner, together with copies of all reinsurance contracts with the surety company, before any such Payment Bond and Performance Bond is eligible to be considered acceptable by the Owner.
- E. ALL CONTRACTORS SHALL SUBMIT THE NAME, ADDRESS AND TELEPHONE NUMBER OF THE CORPORATED SURETIES PROVIDING THE PAYMENT BOND AND PERFORMANCE BOND AND THE LOCAL AGENT.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION (Not Applicable)****END OF SECTION**

SECTION 00 62 76.13 — TAX EXEMPT ORGANIZATION CERTIFICATE

PART 1 - GENERAL

1.1 DEFINITION

- A. This Contract is to be performed for an exempt organization as defined by Title 2; Subtitle E; Chapter 150 of the Texas Limited Sales, Excise and Use Tax Act and Section 151.311 of the State Statutes. The Owner will furnish the Contractor proof or Certificate of Exemption upon award of contract.
- B. Proposer shall not include sales tax in their Proposal.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 00 73 00 — SUPPLEMENTARY CONDITIONS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS: SUPPLEMENTARY CONDITIONS**

- A. The Supplementary Conditions modify, change, delete from or add to the General Conditions and shall apply to each and every Section of the Work as though written in full therein.
- B. The following paragraphs and subparagraphs take precedence over the General Conditions. Where any part of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered provisions remain in effect.
- C. Paragraph numbers and titles refer to like numbers and titles in the General Conditions.

1.2 EXECUTION, CORRELATION AND INTENT**1.3 Add the following subparagraphs.****1.4 1.2.6 Scope paragraphs placed at the beginning of the SECTIONS present a brief indication of the principal Work included in that SECTION, but do not limit Work to subject mentioned nor purport to itemize Work that may be included.****1.5 The Relation of Specifications and Drawings shall be equal in authority and priority. Should they disagree in themselves, or with each other, bids shall be based on the most expensive combination of quality and quantity of work indicated. The appropriate Work, in the event of the above mentioned disagreements, shall be determined by the Architect, at no additional cost to the Owner.****1.6 1.2.8 Failure to report a conflict in the Contract Documents, prior to opening of Proposal, shall be deemed evidence that the Contractor has elected to proceed in the more expensive manner, at no additional cost to the Owner.**

- A. 1.2.9 The Specifications have been partially “streamlined” and some words and phrases have been intentionally omitted. Missing portions shall be supplied by inference as with notes on drawings.

- B. 1.2.10 The words “approved”, “inspected”, “directed”, “selected”, and similar words and phrases shall be presumed to be followed by “by Architect”. The words “satisfactory”, “submitted”, “reported”, and similar words and phrases shall be presumed to be followed by “to Architect”. Words like “install”, “provide”, “locate”, “furnish”, and “supply” shall be construed to include complete furnishing and installing of construction. Words like “Bids”, “Bidders”, shall be construed to be “Proposals”, “Proposers”, or “offers”, offerors”, respectively.

C. INFORMATION AND SERVICES REQUIRED OF THE OWNER

- D. Delete 2.2.5 and replace with the following subparagraph.

E. LABOR AND MATERIALS

- F. Add the following subparagraphs 3.4.3 and 3.4.4 to 3.4:
- G. After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications).
- H. By making requests for substitutions based on subparagraph 3.4.3 above, the Contractor:
 - 1. Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - 2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
 - 3. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects, all at no additional cost to the Owner.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3.1 CHANGE TO READ:

Mutual acceptance of a lump sum properly itemized in accordance with 7.3.6.1, 7.3.6.2 and 7.3.6.3. Items listed in 7.3.6.4 and 7.3.6.5 shall be a part of the overhead scheduled 7.3.10 following. Items shall be supported by sufficient substantiating data to permit evaluation;

7.3.6 In the first sentence, delete the words "a reasonable allowance for overhead and profit" and substitute "an allowance for overhead and profit in accordance with Clauses 7.3.10.1 through 7.3.10.6 following:

7.3.6.4 DELETE the final "and" then add the following to the sentence: are a part of overhead schedule in 7.3.10 following".

7.3.6.5 ADD the following to the sentence: "are apart of overhead schedule in 7.3.10 following".

ADD the following subparagraph 7.3.10 to 7.3:

7.3.10 In subparagraph 7.3.6, the allowance for the combined and profit included in the total cost to the Owner shall be based on the following schedule:

- 1. For the Contractor, for Work performance by the Contractor's own forces, 10 percent of the cost.
- 2. For the Contractor, for Work performance by the Contractor's contractor, 6 percent of the amount due to the Sub-subcontractor.
- 3. For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, 10 percent of the cost.
- 4. For each Subcontractor, for Work performed by the Subcontractor's, Sub-subcontractor's, 6 percent of the amount due the Sub-subcontractor.
- 5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
- 6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$500.00 be approved without such itemization.

8.1 DEFINITIONS

Add the following subparagraph.

8.1.5 The term working Day as used in the Contract Documents for extensions of time shall mean normal working day excluding weekends and legal holidays.

8.3 DELAYS AND EXTENSIONS OF TIME

Delete paragraph 8.3.2 and replace with the following subparagraph.

8.3.2 Any claim for extension of time shall be made in writing to the Architect not more than ten (10) days after the commencement of the delay; otherwise, it shall be waived. In case of a continuing delay only one claim is necessary. In case of claims for extensions of time because of adverse weather, such extensions of time shall be granted only when such adverse weather prevented the execution of major items of Work on normal working days and exceeds the number of days included in the Contract time. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. In the event an extension of time is

granted such extension shall be the complete claim allowed. Contractor shall not be entitled to additional compensation such as, but not limited to, compensable extended overhead or lost profit.

9.6 PROGRESS PAYMENTS

Add the following subparagraph to 9.6.1

1. Unless otherwise indicated in the Agreement, the Owner will pay ninety-five (95%) percent of the amount due the Contractor on account of progress payment until final payment.

Add the following paragraphs to 9.11 to Article 9:

9.11 LIQUIDATED DAMAGES:

9.11.1 If the Contractor neglects, fails or refuses to complete the Work within the time specified in the Contract, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as part consideration of the awarding of this Contract, to pay the Owner the amount of **FIVE HUNDRED DOLLARS (\$500.00)** not as a penalty but as a liquidated damages for such breach of Contract as hereinafter setforth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contractor for completing the Work.

9.11.2 The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would, in such event, sustain.

9.11.3 TIME SPECIFIED IN CONTRACT IS AS FOLLOWS:

The Undersigned agrees to commence work within ten (10) days of Notice to Proceed and to substantially complete the work on or before 270 calendar days after the date of Notice to Proceed.

11.1 Article 11.1 Modify to include the following:

The Contractor shall furnish three (3) copies of insurance certificates to the Architect's office two (2) days after award of the project and before signing of the contract. The Certificate of Insurance shall include thirty (30) Day Notice of Cancellation; Architect and Owner shall receive the same notice in regard to any policy changes. Owner and Architect shall be named as additional insured by the Contractor but not with respect to payment of premiums due under Contractor's policies. Coverage shall include any off site-work on adjacent public or private property.

Insurance Company/Carrier issuing the certificates must be listed by A.M. Best and have an "A" rating or better and based in the United States Mainland.

The insurance as required in Article 11.1 shall have "Minimum Limits" as follows:

A. WORKER'S COMPENSATION INSURANCE: Statutory Requirements-

1. All States Endorsements (Broad)
2. Voluntary Compensation
3. Waiver of Subrogation Endorsement

B. MINIMUM EMPLOYER'S LIABILITY: \$100,000/\$100,000/\$500,000

C. COMPREHENSIVE GENERAL LIABILITY INSURANCE MINIMUM LIABILITY AND COVERAGE:

1. Bodily Injury \$500,000 each person/\$500,000 each occurrence
2. Property Damage \$100,000 each occurrence/\$100,000 aggregate
OR-
3. \$500,000 Combined Single Limit Per Occurrence Bodily Injury and Property Damage.
 - a. Premises and operations coverage
 - b. Explosion and collapse hazard coverage
 - c. Underground hazard coverage
 - d. Products/completed operation hazard coverage with limits and coverage continuing one (1) year after job completion.
 - e. Broad Form property damage coverage
 - f. Personal injury coverage
 - g. Waiver of subrogation endorsement
 - h. Contractual liability (Broad Form) coverage
 - i. Independent contractors coverage (Owners, Architects, and Contractors protective)

NOTE: If General Liability coverage is written on a "Claims Made" basis, the Certificate of Insurance should so indicate. If so written, Contractor agrees that coverage so certified beyond job completion and that coverage written will apply to claims made DURING CONSTRUCTION AND FOR ONE (1) YEAR THEREAFTER.

D. AUTOMOBILE LIABILITY INSURANCE with minimum limits of:

1. Bodily Injury: \$250,000 each person/\$500,000 each occurrence
2. Property Damage: \$250,000 each occurrence/\$500,000 Combined Single Limit per Occurrence Bodily Injury and Property Damage.
3. Automobile Liability Insurance shall include coverage for owned, non-owned, and hired vehicles with limits not less than shown above.

E. OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY:

1. Bodily Injury \$500,000 Single limit each occurrence
2. Property Damage \$250,000 each occurrence/\$250,000 aggregate

F. UMBRELLA LIABILITY:

Minimum combined single limits \$100,000 with same inception and expiration dates as underlying liability policies and with coverage no less broad than in primary program.

G. BUILDER'S RISK INSURANCE:

The Contractor shall FURNISH AND PAY FOR and issue a Certificate of Builder's Risk Coverage to the Owner/Architect in accordance with the General Conditions and Conditions of the Contract.

H. ARTICLE 11.4: PERFORMANCE BOND AND PAYMENT BOND:

Delete in its entirety and substitute the following:

11.4.1: Prior to signing of the Contract, the CONTRACTOR, at HIS/HER OWN EXPENSE, shall furnish a Performance Bond, and a Labor and Materials Payment Bond for one hundred (100%) percent of the Contract price on such form and with such sureties as the Owner may approve. ***Surety company furnishing the Bond must be listed by A.M. BEST and have an "A" rating or better and be based in the United States Mainland and authorized to provide such bonds on public work in the State of Texas.***

I. Any Payment Bond and Performance Bond furnished pursuant to the provisions of Art. 5160, Vernon's Texas Civil Statutes, connected with this project, shall be furnished by a corporate surety or corporate or corporate sureties in accordance with Article 7.19-1, Vernon's Texas Insurance Code, that has a stated capital and surplus (as reported by it to the Texas Insurance Commission in its most recent report) that is in excess of ten times the stated amount of the Payment Bond or the Performance Bond. Provided however, that if any Payment Bond or any Performance Bond is in an amount in excess of ten percent (10%) of the surety company's capital and surplus (as reported to the Texas Insurance Commission in its most recent report), as a condition to accepting the bond, the Owner must receive written certification and information, satisfactory in form and substance to the Owner, that the surety company has reinsured the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus, with one or more reinsurers who are duly authorized, accredited or trustee to do business in the State of Texas. For the purpose of this requirement, any amount reinsured by any reinsurer may not exceed ten percent (10%) of the reinsurer's capital and surplus (as reported to the Texas Insurance Commission by the reinsurer in its most recent report). In the event there is one or more reinsurer, the surety company must provide all necessary information and certification related to the current financial condition of the surety company and any and all reinsurers required by the Owner, together with copies of all reinsurance contracts with the surety company, before any such Payment Bond and Performance Bond is eligible to be considered acceptable by district.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)



AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

BETWEEN the Owner:

(Name, legal status, address and other information)

and the Contractor:

(Name, legal status, address and other information)

for the following Project:

(Name, location and detailed description)

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Architect:

(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

(Check one of the following boxes.)

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

- Not later than () calendar days from the date of commencement of the Work.

By the following date:

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

Portion of Work	Substantial Completion Date
-----------------	-----------------------------

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

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item	Price
------	-------

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
------	-------	---------------------------

§ 4.3 Allowances, if any, included in the Contract Sum:

(Identify each allowance.)

Item	Price
------	-------

§ 4.4 Unit prices, if any:

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

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.5 Liquidated damages, if any:

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

§ 4.6 Other:

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

(Federal, state or local laws may require payment within a certain period of time.)

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

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

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

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

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

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

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

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

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

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

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

§ 5.1.9 Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner’s final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

§ 5.3 Interest

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

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

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a court of competent jurisdiction
- Other (Specify)

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

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

§ 8.5 Insurance and Bonds

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

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

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number

Title

Date

.6 Specifications

Section

Title

Date

Pages

.7 Addenda, if any:

Number

Date

Pages

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

.8 Other Exhibits:

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

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:

(Insert the date of the E204-2017 incorporated into this Agreement.)

The Sustainability Plan:

Title

Date

Pages

Supplementary and other Conditions of the Contract:

Document

Title

Date

Pages

.9 Other documents, if any, listed below:

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

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

OWNER (Signature)

(Printed name and title)

CONTRACTOR (Signature)

(Printed name and title)



AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

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

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

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

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

TABLE OF ARTICLES

- A.1 GENERAL
- A.2 OWNER'S INSURANCE
- A.3 CONTRACTOR'S INSURANCE AND BONDS
- A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's

property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

Cause of Loss	Sub-Limit
---------------	-----------

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit
----------	-----------

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

- § A.2.4.1 **Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.
- § A.2.4.2 **Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.
- § A.2.4.3 **Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.
- § A.2.4.4 **Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.
- § A.2.4.5 **Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.
- § A.2.4.6 **Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.
- § A.2.4.7 **Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

- § A.2.5.1 **Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

§ A.2.5.2 Other Insurance

(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits
----------	--------

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than _____ (\$__) each occurrence, _____ (\$__) general aggregate, and _____ (\$__) aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to, or destruction of, tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the work involves such hazards.
- .11 Claims related to explosion, collapse, and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than _____ (\$__) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than _____ (\$__) each accident, _____ (\$__) each employee, and _____ (\$__) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than _____ (\$__) per claim and _____ (\$__) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than _____ (\$__) per claim and _____ (\$__) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than _____ (\$__) per claim and _____ (\$__) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than _____ (\$__) per claim and _____ (\$__) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than _____ (\$__) per claim and _____ (\$__) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

§ A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below.

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below.)

(Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

§ A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than _____ (\$____) per claim and _____ (\$____) in the aggregate, for Work within fifty (50) feet of railroad property.

§ A.3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than _____ (\$____) per claim and _____ (\$____) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

§ A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

§ A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

§ A.3.3.2.6 Other Insurance

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type	Penal Sum (\$0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

Sample



General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

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

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

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

§ 3.4 Labor and Materials

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

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

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

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

time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

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

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

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

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

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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

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

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

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

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

constitute a waiver of Claims.

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

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

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

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

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

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

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

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

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

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

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

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

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

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 01 11 00 - SUMMARY

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUMMARY OF WORK

- A. Project Identification: As follows:
 - 1. Project: Starr County Courthouse Temporary Housing Interior Build-Out
 - 2. Owner: The County of Starr
 - 3. Location: 1920 US-83, Rio Grande City, TX 78
- B. Contract Documents, dated November 12, 2025 were prepared by Milnet Architectural Services, 608 S. 12th St. McAllen, TX. 78501.
- C. The Work consists of an 8,460 sq. ft. interior build-out of the former Zarsky Lumber Yard Company Hardware store located at 1920 US-83 in Rio Grande City, TX, to provide temporary housing for the Starr County Courthouse. The temporary courthouse will include two courtrooms with holding cells, office spaces for the county judges and staff, and additional required bathroom facilities. The scope of work includes, but is not limited to, demolishing the existing interior finishes and building out the space with new interior walls and finishes, along with minor exterior upgrades. The project will also include mechanical, electrical, plumbing, and other necessary improvements.

1.3 WORK RESTRICTIONS

- A. Contractor's Use of Premises: During construction, Contractor shall have **limited** use of **site** indicated. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of Project.
- B. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
- C. Move any stored Products, under Contractor's control, which interfere with operations of the Owner and separate contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 UNIT PRICES

- A. Changes to the Work incorporating Unit Prices will be made by Change Order.

1.3 CONTRACT MODIFICATION PROCEDURES

- A. On Owner's approval of a proposal from Contractor, Architect will issue a Change Order on AIA Document G701, for all changes to Contract Sum or Contract Time.
- B. When Owner and Contractor disagree on the terms of a proposal, Architect may issue a Construction Change Directive on AIA Document G714, instructing Contractor to proceed with the change. Construction Change Directive will contain a description of the change and designate the method to be followed to determine changes to Contract Sum or Contract Time.

1.4 PAYMENT PROCEDURES

- A. Submit a Schedule of Values **at least 10 days before** the first Application for Payment. In Schedule of Values, break down Contract Sum into at least one line item for each Specification Section, showing both material and labor. Correlate the Schedule of Values with Contractor's Construction Schedule.
- B. Submit 3 copies of each application for payment on AIA Document G702/703, according to the schedule established in Owner/Contractor Agreement.
 1. For the second Application for Payment through the Application for Payment submitted at Substantial Completion, submit partial releases of liens from each subcontractor or supplier for whom amounts were requisitioned in the previous Application for Payment.
 2. Contractor shall submit along with each Application for Payment, any proposed delay days, rain/weather days, additional general conditions incurred and an updated construction schedule.
 3. The Architect will not review or consider approval of any proposed delay days or additional general conditions incurred that are not submitted within **ten (10) calendar days** of said event(s) taking place.

4. Submit final Application for Payment after completion of Project closeout procedures with release of liens and supporting documentation. Include consent of surety to final payment and insurance certificates.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 21 00 — ALLOWANCES

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

- A. Section 01 20 00 – Price and Payment Procedures.

1.3 CONTINGENCY ALLOWANCE

- A. Include in the Contract, a stipulated sum of **Ninety-Thousand Dollars, (\$ 90,000.00)** for use upon Architect's instruction.

1.4 PROCEDURES FOR MANAGING ALLOWANCES

- A. Contractor's direct costs for Products, delivery, installation, labor, bonding, and equipment rental will be included in Construction Change Directives authorizing expenditure of funds from Allowances.
- B. Funds will be drawn from Allowances only by Construction Change Directives. Additional markups for overhead, profit, and other fees will not be allowed.
- C. At closeout of Contract, funds remaining in Allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUBSTITUTION REQUIREMENTS

- A. When a material, article, or method is specified using the name of a proprietary product manufacturer, vendor, or method followed by the phrase "or equal," the specific item mentioned establishes the basis upon which projects are to be built.
 - 1. Other manufacturers' materials, articles, and methods not named will be considered as substitutions provided the required information is submitted on the "SUBSTITUTION REQUEST FORM" and will not require substantial revisions of Contract Documents.
 - 2. This applies to specific construction methods when required by Contract Documents.
 - 3. Substitution Requests must be filled out on the enclosed "Substitution Request Form".
- B. Whenever a material, article, or method is specified or described without the phrase "or equal," no substitutions will be allowed.
- C. Costs for redesigns due to substituted items are the responsibility of the Applicant.
- D. In making a request for substitution, Applicant/Contractor represents that he:
 - 1. Has personally investigated the proposed product or method and determined that it is equal in all respects to that specified.
 - 2. Will provide the same guarantee for substitution as for the product or method specified.
 - 3. Will coordinate installation of accepted substitution into work, making design and construction changes to complete work in all respects following the Contract Documents.

1.3 SUBMITTAL OF DATA FOR PROPOSED SUBSTITUTIONS

- A. In order for substitutions that do not change design intent to be considered, submit **no later than 8 days** prior to bid date deadline, 3 copies of complete data set forth herein to permit complete analysis of proposed substitutions listed on submitted "SUBSTITUTION REQUEST FORM".
 1. For Products:

- a. Identification including manufacturer's name and address.
- b. Manufacturer's literature, including but not necessarily limited to:
 - 1) Product description, performance, and test data.
 - 2) Reference standards.
- c. Samples where appropriate.
- d. Name and address of similar projects on which product was used and dates of installation with contact name and telephone number.

2. For Construction Methods:

- a. Detailed description of proposed method.
- b. Drawings illustrating methods.
- c. Name and address of similar projects on which method was used and dates of use with contact name and telephone number.

3. Comparison of proposed substitution with product or method specified

4. Data relating to impact on construction schedule by proposed substitution.

5. Impact on other contracts.

1.4 APPROVAL OF SUBSTITUTION

- A. Architect's decision regarding evaluation of substitutions will be final and binding.
- B. All approved substitutions will be incorporated into the Contract Documents by Addendum.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

SUBSTITUTION REQUEST FORM

Project: _____ Substitution Request Number: _____

To: _____ From: _____

Re: _____ Date: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
 Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
 Substitution rejected - Use specified materials.
 Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 PROJECT MANAGEMENT AND COORDINATION

- A. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.
- B. Coordinate construction to ensure efficient and orderly execution of each part of the Work.
- C. Progress meetings will be held at Project site every two weeks. Notify Owner and Architect of meeting dates. Each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend. The Contractor shall:
 - 1. **Prepare a progress meeting agenda.**
 - 2. **Prepare a sign in sheet for each progress meeting.**
 - 3. **Prepare minutes of each meeting and distribute to parties present.**

1.3 CONSTRUCTION SCHEDULE

- A. Prepare a horizontal bar-chart construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion.
 - 1. Submit within twenty (20) days after date established for Commencement of the Work.
 - 2. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
 - 3. Indicate Substantial Completion and allow time for Architect's procedures necessary for certifying Substantial Completion.
 - 4. Schedule Distribution: Distribute copies to Owner, Architect, subcontractors, and parties required to comply with dates.

5. Updating: Revise the schedule after each meeting or activity where revisions have been made. Distribute revised copies to Owner, Architect, subcontractors, and parties required to comply with dates.

1.4 SUBMITTAL PROCEDURES

- A. Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and activities that require sequential operations.
 1. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work.
 2. Architect will not accept submittals from sources other than Contractor.
- B. Prepare submittals by placing a permanent label on each for identification. Provide a 4 by 5 inch space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:
 1. Project name.
 2. Date.
 3. Name and address of Contractor.
 4. Name and address of subcontractor or supplier.
 5. Number and title of appropriate Specification Section.
 6. Contractor's certification that materials comply with specified requirements.
- C. Coordinate each submittal with other submittals and with work that does not require submittals.
- D. Product Data: Mark each copy to show applicable choices and options. Include the following:
 1. Data indicating compliance with specified standards and requirements.
 2. Notation of coordination requirements.
 3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.
- E. Shop Drawings: Submit newly prepared information drawn to scale. Do not reproduce Contract Documents or copy standard information. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Architect will return the reproducible print. Include the following:
 1. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
 2. Identification of products and materials.
 3. Notation of coordination requirements.
 4. Notation of dimensions established by field measurement.
 5. Identification of deviations from Contract Documents.
- F. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit sufficient units to show limits of the variations. Include product name or name of the manufacturer.
- G. Architect will review each submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 33 00 - SUBMITTALS**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide shop drawings, product data, physical samples and color samples as indicated herein and in each technical section of these specifications.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Additional submittal requirements specific to the particular section of the specifications.

PART 2 - PRODUCTS**2.1 SHOP DRAWINGS**

- A. Prepare shop drawings using competent draftsmen, clearly and precisely showing the following:
 1. The size and gage of members.
 2. The method of anchoring and securing members of parts together.
 3. The quantity and location of each item.
 4. Other pertinent data necessary to show the Work to be done and where and how it is to be done.
- B. Prepare Drawings to scale, including full size details as required to fix and illustrate the Work required. Do not use Contract Documents or reproductions thereof as shop drawing submittals.
- C. Each sheet of Drawings shall be 30 x 40 inches maximum size with borders. Provide a title block in the lower right hand corner with the following information:
 1. Title of the sheet.
 2. Name and location of Project.
 3. Names of:
 - a. Architect/Engineer.
 - b. General Contractor.
 - c. Manufacturer of the specified materials and equipment.

4. The date of the Submittal.
5. The date of each correction or revision.
6. **Submittal number including Division No.** (such as submittal no. 3 under Division 11 is numbered "11-03").

D. Fold drawings to 8-1/2x11 inch dimensions with title block exposed to top.

E. Check the Drawings and add any corrections of field measurements needed. Stamp and sign the Contractor's approval, checker's signature, and date of approval before submitting to the Architect. Shop Drawings which do not bear the Contractor's stamp or have not been reviewed by the Contractor, will be returned by the Architect without review or approval.

F. Number Shop Drawings consecutively. Indicate working and erection dimensions, arrangements, sectional views, necessary details including complete information for making connections with other Work, kinds of materials, and finishes.

G. Provide a transmittal letter in duplicate, pointing out any deviations from items, methods or named manufacturers included in the Specifications or on the Drawings. Note submittal file number including Division.

H. Submit six (6) blue line prints of each Shop Drawing sheet.

I. Make such corrections, changes, resubmit bound sets of Shop Drawings prints, as required herein, until approved is obtained. Any corrections or changes indicated on Shop Drawings shall not be considered as an extra work order.

2.2 PHYSICAL SAMPLES

- A. Provide duplicate samples of items as specified. Samples shall be 12 inches square or 12 inches long unless noted otherwise. Minimum liquid samples shall be 1 pint. Installed materials shall match approved samples.
- B. For Architect's permanent files provide one (1) 6" x 6" sample of all interior finishes, colors and materials (aluminum finish, glazing, plastic laminate, paint finish flooring materials, ceiling finish, etc.)
- C. Provide a transmittal letter with each sample, listing the following:
 1. Specification section title and paragraph specifying the material.
 2. Name and location of Project.
 3. Names of:
 - a. Architect/Engineer.
 - b. General Contractor.
 - c. Manufacturer of the specified materials and equipment.
 4. The date of the Submittal.
 5. Submittal file number including Division.
- D. If samples are not acceptable they will be returned directly to the Contractor for modification and resubmission.
- E. If samples are acceptable, notification will be sent directly to the Contractor, and the sample retained for comparison with the complete Work.
- F. Electronic samples are **not acceptable** (PDF, JPEG, TIFF, etc.).

2.3 MANUFACTURER'S PRODUCT DATA

- A. Provide **six (6)** copies of pre-printed Product Data of items as specified. Carefully mark out all items not applicable to the specified item.
- B. Standard catalogs, brochures, etc. including information not applicable to the project and not marked through, will be returned without review or approval.
- C. Provide a transmittal letter with the Product Data from each manufacturer, listing the following information:
 1. Name and location of Project.
 2. Names of:
 - a. Architect/Engineer.
 - b. General Contractor.
 - c. Manufacturer of the specified materials and equipment.
 3. The date of the Submittal.
 4. Submittal file number including Division.
- D. If Product Data is not approved, one copy will be marked and returned directly to the Contractor for modification and resubmission.
- E. If Product Data is approved, notification and one copy of the acceptable Product Data will be sent directly to the Contractor.
- F. When requested by the Architect, provide six (6) copies of each ASTM Federal Specification, or other applicable documents referenced in the material Section.

PART 3 - EXECUTION

3.1 REVIEW PROCEDURE

- A. Submittals will be reviewed with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Architect shall be allowed a maximum review period of **fourteen (14)** calendar days. The review of a separate item shall not indicate a review of an assembly in which the item functions. Submittals that contain excessive errors or that are incomplete will be returned without review and approval and any delay caused thereby shall be the responsibility of the Contractor.
- B. If any submittals are not approved as submitted, all copies will be returned directly to the Contractor for revision. The reviewed submittals will be returned to the Contractor as soon as practicable.
- C. The Contractor shall make all revisions as noted and shall resubmit the required number of corrected copies of submittals, until no exceptions are taken. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than those requested on previous submissions.
- D. The review of submittals shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents unless the Contractor has submitted, in writing, such deviations and written approval has been given to each specific deviation. The review shall not relieve the Contractor from responsibility for errors and omissions in the Shop Drawings and samples.

- E. No portion of the Work requiring a submittal shall commence until the submittal has been approved as designated in the Conditions of the Contract. All such portions of the Work shall be in accordance with the submittal that has been stamped with final "Reviewed Without Exceptions" note, or "Approved" note.
- F. Materials and equipment specified or approved prior to beginning the Work are required to be used on the Project. Any proposed substitution resulting from no availability of specified items must be proven "better than" by the Contractor and approved in writing by the Architect. Substitutions included in submittals shall be so noted and brought to the Architect's attention in the submittal and on the transmittal. Failure to follow this procedure will render the substitution as not acceptable whether or not reviewed by the Architect.
- G. The Contractor shall have the approved shop drawings at the site at all times for use in the construction of the Work. Failure of the Contractor to supply such drawings will be deemed sufficient cause to delay the Work until such drawings are available for field use and reference.
- H. For submittals that will be reviewed by one of the Architect's consultants, these submittals shall be delivered directly to the Architect. The Architect will then be responsible to provide the Consultant with a copy of the submittal.
- I. For submittals that will be reviewed by one of the Architect's consultants, do not send to the Consultant as part of the package any items which will be reviewed by the Architect. As an example, do not provide a single submittal package combining Structural Steel and Miscellaneous Metal Fabrications.

END OF SECTION

SECTION 01 35 16 — ALTERATION PROJECT PROCEDURES**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

- A. Products and installation for patching and extending Work.
- B. Transition and adjustments.
- C. Repair of damaged surfaces, finishes, and cleaning.

1.3 RELATED SECTIONS

- A. Section 01 11 00 – Summary: Work sequence and Phasing.
- B. Section 01 73 29 – Cutting and Patching: Requirements and limitations for cutting and patching of work.
- C. Section 01 50 00 – Temporary Facilities and Controls: Temporary enclosures, protection of installed work, and cleaning during construction.

PART 2 - PRODUCTS**2.1 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 inspecting and testing Products where necessary, referring to existing Work as a standard.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Cut, move, or remove items as necessary for access to alterations and renovation Work. Store items scheduled for reinstallation. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated 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, salvaged, and stored items from weather and extremes of temperature and humidity. Temporarily seal wall cavities and substrates exposed by cutting, patching, and demolition work to prevent accumulation and trapping of moisture which will allow the development of mildew.

3.3 INSTALLATION

- A. Coordinate work of alterations and renovations to expedite completion sequentially. Do not remove existing items which weatherproof buildings (windows, roofing, doors, exterior finishes etc.) until new materials and items are ready for installation.
- B. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring products and finishes to specified condition. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes, in accordance with Section 01 73 29 – Cutting and Patching.
- C. Install Products as specified in individual sections.

3.4 TRANSITIONS

- A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch 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 of division. Consult Architect for direction on making transitions.

3.5 ADJUSTMENTS

- A. Where removal of partitions or walls result in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- B. Fit work at penetrations of surfaces as specified in Section 01 73 29 – Cutting and Patching.

3.6 REPAIR OF DAMAGED SURFACES

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.

3.7 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 entire surface to nearest intersections.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

- A. Quality-control services include inspections, tests, and related actions including reports. Quality-control services are further specified in other Sections of these Specifications and shall be performed by independent testing agencies provided by Contractor or Owner, as specified.
 - 1. Unless otherwise indicated, quality-control services required by authorities having jurisdiction will be provided by Owner.
- B. Contractor is responsible for scheduling inspections and tests.
- C. **Retesting: Contractor shall pay for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.**
- D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify agency in advance of operations requiring tests or inspections, to permit assignment of personnel. Auxiliary services include the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities to assist inspections and tests.
 - 3. Adequate quantities of materials that require testing, and assisting in taking samples.
 - 4. Facilities for storage and curing of test samples.
 - 5. Security and protection of samples and test equipment.
- E. Duties of Testing Agency: Testing agency shall cooperate with Architect and Contractor in performing its duties. Agency shall provide qualified personnel to perform inspections and tests.
 - 1. Agency shall promptly notify Architect and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 - 3. Agency shall not perform duties of Contractor.

F. Submittals: Testing agency shall submit a certified written report of each inspection and test to the following:

1. Owner.
2. Architect.
3. Contractor.
4. Structural engineer.
5. Authorities having jurisdiction, when authorities so direct.

G. Report Data: Reports of each inspection, test, or similar service shall include at least the following:

1. Name, address, and telephone number of testing agency.
2. Project title and testing agency's project number.
3. Designation (number) and date of report.
4. Dates and locations where samples were taken or inspections and field tests made.
5. Names of individuals taking the sample or making the inspection or test.
6. Designation of the product and test method.
7. Complete inspection or test data including an interpretation of test results.
8. Ambient conditions at the time of sample taking and testing.
9. Comments or professional opinion on whether inspected or tested Work complies with requirements.
10. Recommendations on retesting or reinspection.
11. Name and signature of laboratory inspector.

H. Testing Agency Qualifications: Engage inspection and testing agencies that are prequalified as complying with the American Council of Independent Laboratories' "Quality Assurance Manual" and that specialize in the types of inspections and tests to be performed.

1. Each testing agency shall be authorized by authorities having jurisdiction to operate in the state where Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 50 00 — TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and fax service, water, and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Facilities: Access roads, parking, progress cleaning, project signage and temporary buildings.

1.3 TEMPORARY ELECTRICITY

- A. Cost: By General Contractor. Temporary Electricity shall be provided up until Architect issues Substantial Completion.
- B. Utilize existing power service if approved by Owner. If existing power service usage is approved by the Owner, the Contractor shall reimburse the Owner for the dollar amount of electrical consumption during the course of construction. Extend temporary outlets in NEC and OSHA approved manner to facilitate construction.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- D. Provide main service disconnect and over correct protection at convenient location.
- E. Provide sufficient and adequate distribution equipment, wiring, and outlets to ensure unimpeded progress of the Work.
- F. Permanent convenience receptacles may be utilized during construction.

1.4 TEMPORARY LIGHTING

- A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Permanent building lighting may be utilized during construction.
- E. Maintain lighting and provide routine repairs.

1.5 TEMPORARY HEAT

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in product sections.

1.6 TEMPORARY COOLING

- A. If required for the proper installation of particular materials, systems, or equipment, provide and pay for cooling devices and cooling as needed to maintain specified conditions.

1.7 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidify, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Utilize existing ventilation equipment if approved by Owner. Extend and supplement equipment with temporary fan units as required to maintain clear air for construction operations.

1.8 TELEPHONE SERVICE

- A. Provide, maintain and pay for telephone service to field office.

1.9 FAXSIMILE SERVICE

- A. Provide, maintain and pay for separate telephone line to be used solely for fax service to field office.

1.10 TEMPORARY WATER SERVICE

- A. Cost: By General Contractor. Utilize existing water service if approved by Owner for construction operations. If existing water service usage is approved by the Owner, the Contractor shall reimburse the Owner for the dollar amount of water consumption during the course of construction.

- B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing as required.

1.11 TEMPORARY SANITARY

- A. Provide and maintain required facilities and enclosures. Existing facility use is **not** permitted. Provide at time of project mobilization.

1.12 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas to protect existing facilities and adjacent properties from damage from construction operations and demolition. Barriers must isolate occupied use from construction activities. If and when needed, barriers must be capable of attenuating sound.
- B. Provide protection for existing plant life and landscaped. Maintain plant life and landscaped areas as necessary during construction operations. Replace damaged plant life.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- D. Barrier plan and method subject to approval by the Architect and the Owner.

1.13 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site, equip with vehicular and pedestrian gates with locks. Fence must be capable of restricting entry by on-site facility users.

1.14 WATER CONTROL

- A. Grade site to drain where additions are undertaken. Maintain excavations free of water. Provide, operate, and maintain pumping equipment and/or any other means, methods or techniques necessary to maintain excavation and site free of water.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.15 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protect for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- B. Provide temporary protection of existing wall cavities, substrates, and surfaces exposed to weather during cutting and minor demolition operations to prevent entrapment of moisture and development of mildew.

1.16 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection to prohibit damage and where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. 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.
- F. Prohibit traffic in all landscaped areas.

1.17 SECURITY

- A. Provide security and facilities to protect Work and existing facilities from unauthorized entry, vandalism, or theft.
- B. Coordinate project security program with Owner's existing security operations at project mobilization.
- C. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.
- D. Restrict entrance of persons and vehicles into Project site and existing facilities, allowing entrance only to authorized persons and persons identified by the Contract Document and/or the Architect or Owner as authorized to visit Project site.

1.18 ACCESS

- A. Provide and maintain temporary roads accessing public thoroughfares to serve construction area.
- B. Extend and relocate as work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Existing on-site roads may be used for construction traffic.

1.19 PARKING

- A. Provide temporary surface parking areas to accommodate construction personnel. Existing site areas may be used if approved in advance by the Owner.
- B. Contractor to propose plan for Owner concurrence and approval.

1.20 PROGRESS CLEANING AND WASTE REMOVAL

- 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 rubbish from site weekly and dispose off-site.

1.21 PROJECT IDENTIFICATION

- A. Provide project sign. Refer to drawings for size and content.
- B. Erect on site at location established by Architect.
- C. No other signs are allowed without Owner permission except those required by law.

1.22 FIELD OFFICES AND SHEDS

- A. Office: Weather tight with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table, phone and fax.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Provide storage sheds and facilities to accommodate Work. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 25 00.
- D. Designated existing covered and uncovered hard paved areas and facilities may be used for field storage areas. Protect and secure existing areas used for storage. Upon completion of Work, clean, repair, and restore all existing areas used for storage and restore to acceptable condition.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials prior to Substantial Completion.
- B. Remove underground installation to a minimum depth of 2 feet. Grade site to drain.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 73 29 — CUTTING AND PATCHING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.3 RELATED SECTIONS

- A. Section 01 10 00 – Summary: Work by Owner or by separate Contractors.
- B. Section 01 35 16 – Alteration Project Procedures.
- C. Section 01 25 00 – Substitution Procedures.
- D. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the section.
 - 2. Advance notification to other sections of openings required in work of those sections.
 - 3. Limitations on cutting structural members.

1.4 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected Work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed Work and Products to be used.

5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate Contractor.
7. Written permission of affected separate Contractor.
8. Date and time work will be executed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution in accordance with Section 01 25 00 – Substitution Procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Structural Elements: If any existing structural elements are damaged during the course of cutting and patching, contractor shall cease activities immediately and notify Architect. Contractor will be responsible to submit a plan for corrective work. This plan shall include a professional structural engineer's recommendation(s). All corrective work shall be at the expense of the General Contractor.
- D. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work. Avoid unnecessary or extended exposure to weather of work exposed by cutting. Avoid entrapment of moisture or other deleterious mater between existing substrates and new work.
- C. Maintain excavations free of water.

3.3 CUTTING

- A. Execute cutting and fitting including excavation and fill to complete the Work.
- B. Uncover work to install improperly sequenced work.
- C. Remove and replace defective or non-conforming work.

- D. Remove samples of installed work for testing when requested.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ skilled installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction

photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- g. Sweep concrete floors broom clean in unoccupied spaces.
- h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- j. Remove labels that are not permanent.
- k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- p. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.

- a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01700

SECTION 02 41 19 - SELECTIVE DEMOLITION**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

- A. Unless otherwise indicated, demolished materials become Contractor's property. Remove from Project site.
- B. Items indicated to be removed and salvaged remain Owner's property. Remove, clean, and deliver to Owner's designated storage area.
- C. Comply with EPA regulations and disposal regulations of authorities having jurisdiction.
- D. Conduct demolition without disrupting Owner's use of the building.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION****3.1 DEMOLITION**

- A. Maintain and protect existing utilities to remain in service before proceeding with demolition, providing bypass connections to other parts of the building.
- B. Locate, identify, shut off, disconnect, and cap off utility services to be demolished.
- C. Employ a certified, licensed exterminator to treat building and to control rodents and vermin.
- D. Conduct demolition operations and remove debris to prevent injury to people and damage to adjacent buildings and site improvements.
- E. Provide and maintain shoring, bracing, or structural support to preserve building stability and prevent movement, settlement, or collapse.

- F. Protect building structure or interior from weather and water leakage and damage.
- G. Protect remaining walls, ceilings, floors, and exposed finishes. Erect and maintain dustproof partitions. Cover and protect remaining furniture, furnishings, and equipment.
- H. Structural Elements: Field verify existing conditions prior to undertaking any demolition activities. Contractor shall investigate existing conditions prior to commencing saw cutting activities, partial concrete removal, concrete coring, penetrations into existing slab and structural steel/wood framing removal or cutting.
- I. Concrete Slab Demolition: If the existing concrete slab is damaged during the course of demolition (post tension cabling damage, rebar damage, aggregate damage, soil disturbance, etc.) contractor shall cease demolition activities immediately and notify Architect. Contractor will be responsible to submit a plan for corrective work. This plan shall include a professional structural engineer's recommendation(s). All corrective work shall be at the expense of the General Contractor.
- J. Structural and Framing Demolition: If any existing structural elements are damaged during the course of demolition (beams, columns, wood framing, rebar, plates, angles, etc.) contractor shall cease demolition activities immediately and notify Architect. Contractor will be responsible to submit a plan for corrective work. This plan shall include a professional structural engineer's recommendation(s). All corrective work shall be at the expense of the General Contractor.
- K. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
- L. Promptly patch and repair holes and damaged surfaces of building caused by demolition. Restore exposed finishes of patched areas and extend finish restoration into remaining adjoining construction.
- M. Promptly remove demolished materials from Owner's property and legally dispose of them. Do not burn demolished materials.

END OF SECTION

SECTION 04 05 13 — MORTAR

PART 1 - GENERAL

1.01 COORDINATION

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

- A. Perform all work required to furnish the Masonry Mortar indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.
- B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

1.03 SUBMITTALS:

- A. Submit product data on all mortar and admixtures.
- B. Submit certification that mortar and grout material meet ASTM standards.

1.04 PRODUCT DELIVERY AND STORAGE:

- A. Delivery: Delivery materials to Project site dry and in unbroken containers.
- B. Storage: Store materials above ground in waterproof shelters.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.
 - 1. PORTLAND CEMENT:
 - a. Capitol Lone Star
 - b. Trinity Texas Industries
 - c. Universal Atlas Cement
 - 2. LIME:

- a. Gibsonburg Lime Products Co., Tiger Limes
- b. Texas Lime Company
- c. United States Gypsum Company
- d. National Gypsum Company

3. WATER PROOFING ADMIXTURE:

- a. Blocktite Mortar Admixture by Euclid Chemical
- b. Sonneborn Building Products-Hydracide
- c. W.R. Grace-Hydratite Plus

4. MORTAR COLOR:

- a. Gray.

5. DRY BLOCK-One pound per cubic foot of cementitious material, $\frac{1}{2}$ sack per sack of 2 sacks of cement fluted, split -face CMU for warranty purposes

B. Refer to Section 01 25 00 - Substitutions Procedures for manufacturers not listed above.

2.02 MATERIALS:

- A. Portland Cement: ASTM C150, TYPE I.
- B. Hydrated Lime: ASTM C207, TYPE S.
- C. Fine Aggregate: ASTM C144,
- D. Coarse Aggregate: ASTM C404, Size No. 8
- E. Water: Clean and free of deleterious acids, alkalies, or organic matter.
- F. Waterproofing Admixture: Blocktite Mortar Admixture, manufactured by Euclid Chemical Co.
- G. Masonry Admixture: "EUCON Blocktite" by the Euclid Chemical Co.

2.03 PROPORTIONS AND MIXING:

- A. Meet requirements of ASTM C270 and proportion mortar types as specified.
- B. Meet requirements of ASTM C476 for masonry grout and proportion grout type as specified.
- C. Proportion material accurately and mix thoroughly by machine to a uniform consistency and color. Mix mortars with the maximum amount of water consistent with workability. Provide waterproofing mortar admixture as specified above.
- D. Do not use mortar that has begun to set. Retemper mortar by adding water if mortar begins to stiffen from evaporation or absorption of a part of the mixing water. Use and place mortar in final position within 2-1/2 hours after mixing.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. See specific section of Masonry Materials for installation instructions.

3.02 MORTAR SCHEDULE:

A. Exterior Masonry Walls:
1. Mortar-Type S, ASTM C270.
2. Waterproofing Admixture-*dry block required to provide warranty*.

B. Interior Masonry Partitions:
1. Mortar-Type N, ASTM C270.

C. Interior Paving Tile:
1. Mortar-Type S, ASTM C270.

D. Exterior Paving Tile:
1. Mortar-Type M, ASTM C270.

3.03 GROUT SCHEDULE:

A. Paving Tile:
1. Portland Cement-one part.
2. Fine Aggregate-three parts.
3. No lime.
4. Sealer

END OF SECTION

SECTION 04 22 00 — CONCRETE MASONRY UNIT**PART 1 - GENERAL****1.01 COORDINATION**

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

- A. Perform all Work required to complete the Concrete Unit Masonry indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.
- B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

1.03 PRODUCTS INSTALLED UNDER THIS SECTION BUT SPECIFIED ELSEWHERE:

- A. Section 04 05 13 – Mortar.
- B. Section 07 92 00 – Sealants and Caulking.

1.04 SUBMITTALS:

- A. Submit technical data for each type of wall reinforcement, anchors and ties.
- B. Submit a 12" long sample of control joint filler.
- C. Submit a certificate that masonry units conform to ASTM and NBFU standards specified.

1.05 STORAGE AND HANDLING:

- A. Handle materials in a manner to prevent breakage and chipping. Store materials on platforms raised off the ground and protect them with stainproof tarpaulin covers.

1.06 ENVIRONMENTAL CONDITIONS:

- A. Lay no masonry when the temperature of the air is 40°F. twenty-four (24) hours after laying. Do not build on frozen work.

B. Store masonry units on the job so that they are kept off the ground and protected from rain.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. CONCRETE MASONRY UNIT:
 1. Best Block
2. GLAZED CONCRETE MASONRY UNIT:
 1. Spectra Glaze, Or Equal
3. REINFORCEMENT, ANCHORS AND TIES:

National Wire Products Corp.	AA Wire Products Company
Heckman Build Products, Inc.	Hohmann and Barnard, Inc.
Masonry Reinforcing Corp. of America	
4. SPLIT FACE BLOCK SEALER:
“DEFY” Split Face Block Water Repellant

2.02 MATERIALS:

A. UNITS:

1. Hollow Concrete Masonry: ASTM C90, medium weight, Grade N-1
2. Pre-Faced Glazed Masonry Units per ASTM C90 Type 1 with facing per ASTM C744

B. REINFORCEMENT:

1. Block Wall Joint Reinforcement:
ASTM A82, AA Wire Products Co., “BLOK-TRUS”, AA600 two wire, width 2” less than wall thickness, standard weight galvanized ASTM A116, Class 1.
2. Lintel and Bond Beam Reinforcement: Domestic, ASTM A615, or ASTM A616, deformations ASTM A305. Unless otherwise shown on drawings provide 2-#4 Ø cont. lap 30 dias.

C. WATER: Clean and free of deleterious acids, alkalies or organic material.

D. **Bullnose edge at all masonry corners for interior walls. Provide sealer for all exterior split face c.m.u.**

PART 3 - EXECUTION

3.01 CONDITION OF SURFACES:

- A. Do not commence with masonry work until foundation has properly cured a minimum of seven (7) days and reinforcing steel that is dowelled for masonry units has been approved.
- B. Consult other trades and make provisions to permit installation of their work to avoid cutting and patching. Before closing up any pipe chase, or similar inaccessible spaces, remove all rubbish and sweep out areas to be enclosed.

3.02 PREPARATION:

- A. Provide, install and maintain all scaffolding, staging and forms of protection necessary for execution of the work; substantially constructed, maintained, moved and dismantled as required to properly follow the sequence of operation.
- B. Provide and install all shores and centering for the work, constructed true to require shape, size and form; well-braced and made rigid in all parts, and capable of supporting and sustaining the loads to which subjected.
- C. Leave all shores and centering in place until the masonry has sufficiently set to safely carry its own weight and the added loads of construction. Shore free-standing walls to prevent windstorm damage until walls are protected.
- D. Examine surfaces to receive masonry and report any discrepancies before commencing work. Accept no former measurements, but lay work according to the plans and dimensions thereon.

3.03 LAYING CONCRETE MASONRY UNITS:

- A. Do not dampen units before laying, and do not lay units which have surface water or contain frost. Lay units plumb, level, and true to a line in running bond, or as indicated. Align on exposed face or as indicated.
- B. Lay first course of masonry in full bed of mortar. Lay all other hollow units in a full mortar bed on shell surface and at ends.
- C. Lay hollow units with the thicker edge of the face shell up and make all joints $3/8$ " thick. Lay corners prior to laying mid-portion of wall. Rock closures into place with the head joints shoved against the two adjacent units in place.
- D. Cut units with power saw through the unit to insure straight, evenly cut edges. Do not use fractional parts of masonry units in the work where whole units can be used.
- E. Avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after setting in place. Remove mortar and replace with fresh mortar where adjustment must be made after initial settings.
- F. Do not use masonry units having cracks, chipped edges, broken corners or other defects in exposed faces. Build walls full thickness as shown. Blocks with open cells exposed will not be permitted.
- G. Provide all special precast lintels, fillers, closers, control joint units, trough tile, etc., required to form all corners, returns, openings, jambs, offsets, etc., to maintain a proper bond throughout all masonry work.
- H. Protect all sills, ledges, off-sets, etc., from droppings of mortar and protect door jambs and corners from damage during construction.
- I. Stop off longitudinal run of masonry only where absolutely necessary by racking one-half block length in each course. Remove loose mortar before new work is started.
- J. Cover tops of walls at end of day's work and when rain is imminent, with waterproof membrane. Overhang two feet on each side of wall and anchor securely. Protect masonry from weather or construction damage.

3.04 JOINTS:

- A. Mortar joints shall be straight, clean and uniform in thickness. Tool joints of all walls to produce a dense surface well bonded to the edges. Joints which are not tight at the time of tooling shall be raked out, pointed, and then tooled.
- B. Tool when the mortar is partially set but still sufficiently plastic to bond. Use a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.
- C. Finish joints that will remain exposed with a tool slightly larger than the width of the joint to form a concave surface. Tool vertical joint first. Finish flush, joint that will not remain exposed.
- D. Unless otherwise specified the horizontal and vertical mortar joints shall be 3/8" thick with full mortar coverage on the face shells and on the webs surrounding cells to be filled with grout.
- E. Vertical head joints shall be buttered well for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds with both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.

3.05 REINFORCING:

- A. Install continuous joint reinforcing 16" on centers for running bond. Install joint reinforcing in the first and second bed joint above and below openings extending 24" beyond each side of opening.
- B. Lap splices a minimum of 6" and install prefabricated corners and tees at such locations. Do not extend reinforcing through expansion joints. Center reinforcing in joint with 5/8" minimum mortar coverage on the exterior face and 1/2" minimum mortar coverage on the interior face.
- C. Do not extend reinforcing through control joints when anchorage is provided on each side of joint. If no anchorage is provided at joint, extend reinforcing through control joint at 48" on center.
- D. Reinforce bond beams and lintels as indicated with continuous bars placed as the work progresses. Maintain 1/2" minimum clear distance between masonry units and reinforcement.

3.06 ANCHORING:

- A. Anchor interior partitions to abutting or intersecting walls by common bond or with prefabricated reinforcing tees.
- B. Anchor interior load bearing partitions laterally a maximum of 12'-0" o.c. by either an intersecting partition or anchorage to foundation with 4-#4Ø dowels and continuous 4 #4Ø bars to top of wall. Grout fill cells to top of wall.
- C. Do not attach construction supports to wall except where specifically permitted by the Architect.
- D. Intersecting load bearing masonry walls and partitions shall be bonded by the use of rigid steel anchors at twenty-four (24) inches o.c. maximum. Corners shall have a standard masonry bond by overlapping units and shall be solid grouted.

3.07 CONTROL JOINTS:

- A. Locate 3/8" wide control joints as indicated but do not exceed 30 feet on centers. Keep vertical joints straight, true and continuous from top to bottom of masonry.
- B. Use sash units to form control joints and install continuous control joint filler with sash units tightly butted to compress neoprene flanges and completely seal joint. Where masonry abuts structural concrete

or steel and control joint filler cannot be used, keep joint clean of mortar as work progresses or use expansion joint spacer.

- C. Locate building expansion joints as indicated and install expansion joint spacer properly recessed back from face to allow for sealant.

3.08 EMBEDDED ITEMS:

- A. Build in flashing, sleeves, anchors, clips, mechanical and electrical items, and accessories as work progresses. Accurately cut units to fit all plumbing, ducts, openings, and electrical work with all holes neatly patched.
- B. Install loose lintels, as indicated in full beds of mortar. Fill voids in metal frames with mortar and install frame anchors.

3.09 GROUTING:

- A. Fill with grout, vertical cells, bond beams, lintels, and other structural members having reinforcement. Secure in place and inspect the reinforcing before grouting. Keep mortar droppings out of grout space and puddle or vibrate all grout in place.
- B. Provide solid bearing under structural members at least 8" vertically and at least 16" horizontally. Bearing shall be hollow units reinforced with 2#4Ø bars U.N.O. and filled with concrete grout.
- C. Build masonry in filled cell construction to preserve the unobstructed vertical continuity of the cells to be filled. Fully bed all walls and cross webs forming such cells to prevent grout leakage and strike the cell joints smooth. Maintain continuous vertical alignment of cells so the unobstructed cell area is at least 2" x 3".
- D. Grout vertical cells in lifts not to exceed 4'-0". Stop grouting at the mid-point where necessary, but not over openings, when filling the trough unit, and provide a suitable dam to retain the grout. Stop grouting one and one-half inches below the top of the last course when filling vertical cells to form a key for the next pour.
- E. Grout from the inside face of the masonry and prevent grout from staining the masonry face. Protect projecting surfaces from droppings and clean immediately any grout that comes in contact with the face of masonry.

3.010 CLEANING:

- A. Keep the face of the blockwork free from excess mortar while laying blocks. Clean blockwork that will remain exposed, promptly, with fiber brushes and clear water. Use of wire brushes or acid is permitted only with specific approval.
- B. Repair and repoint defective work and pin line holes to match adjacent similar work. Replace broken or damaged blocks.

END OF SECTION

SECTION 05 41 00 — LIGHT GAGE METAL FRAMING SYSTEMS AND GYPSUM SHEATHING

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Furnish and install exterior/interior metal stud framing as shown on the drawings and specified herein.
- B. Furnish and install water resistant gypsum board sheathing at exterior face of exterior metal studs.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Masonry.
- B. Interior drywall systems.
- C. Wall Insulation.
- D. Dampproofing and Waterproofing.
- E. Exterior plaster (stucco).

1.4 SUBMITTALS

- A. Submit manufacturer's product data describing all materials.
- B. Submit manufacturer's certification of structural properties, only for products to be used in the project.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered in manufacturer's original packaging and stored flat in a covered, dry area providing protection from damage and exposure to the elements.
- B. Damaged or deteriorated materials shall be removed from the premises.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. STUDS AND FRAMING: Unimast, Clark Dietrich, Maverick Steel Co., Dale Industries, Delta Metals, Bostwick, American Studco Inc.
- B. GYPSUM BOARD SHEATHING: United States Gypsum Co., National Gypsum Co., Domtar Gypsum, Inc. Georgia Pacific, Temple Inland.

2.2 MATERIALS

- A. STRUCTURAL STUDS AND RUNNERS: Galvanized "Cee" studs in sizes and gauges as indicated in the drawings. Unless otherwise indicated in the drawings, minimum gauge shall be 16 gauge and the following structural properties shall apply:

SIZE	ABOUT MAJOR AXIS X-X			ABOUT MINOR AXIS Y-Y		
	lx	Sx	rx	ly	Sy	ry
3-5/8"	.906	.500	1.430	.139	.142	.614
4"	1.145	.572	1.566	.147	.143	.615
6"	3.016	1.005	2.262	.180	.149	.595
8"	6.071	1.518	2.923	.201	.152	.565

- B. SHEATHING FASTENERS: Unimast self-drilling screw fasteners (bugle head).
- C. SHEATHING: Fire resistant gypsum board with treated water resistant gypsum core surfaced with water repellent paper both faces -1/2" x 4' x 8' with tongue and groove joint design at long edges. Meet requirements of ASTM C-79. Provide 5/8" thick rated X core where specifically indicated on the drawings.
- D. All metal studs, track, and bridging shall be formed from ASTM A-446 commercial grade steel having a minimum yield of 33,000 psi for 18 gauge and lighter members and 50,000 psi for 16 gauge and heavier members.
- E. All framing components shall be galvanized. Tracks, runners, bridging and bracing shall match grade and gauge of studs.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install studs plumb and in plane, without twist. System installation shall be in accordance with AISI Design Manual for "Light Gauge Cold Formed Steel".
- B. All framing components shall be cut tight against abutting members. Members shall be held firmly in position until properly fastened.
- C. All attachments of axial loaded framing components shall be welded in accordance with the American Welding Society's "Recommended Practices for Resistance Welding" and shall transfer the imposed load into the adjoining member. Use no splices in axial loaded members.
- D. Attachments of framing components not subject to axial loads may be welded or screw fastened.
- E. Members shall be braced as required to resist all wind loads and construction loading for which the system has been designed. System shall be braced as erected and shall not be left overnight without adequate bracing.
- F. Framing components used to frame openings shall be of a size and type to transfer any load imposed on the opening into the members adjacent to the opening. Additional framing shall be provided adjacent to the opening to carry the load imposed.
- G. Welds in galvanized material shall be coated with "ZRC" cold galvanizing after wire brushing.

3.2 ERECTION

- A. **TRACK FASTENING:** Secure metal floor track to concrete floor slab with Type "A" or "B" fasteners spaced as scheduled in the table below. For determining unbraced wall height, ceiling does not qualify as bracing.
 - 1. Type "A" fastener – minimum 5/32" diameter x 1-1/4" long powder actuated fasteners. Hilti #DS32P10 or Ramset #2335.
 - 2. Type "B" fastener – minimum 1/4" diameter x 2" long drilled sleeve anchor. Hilti sleeve anchor or Ramset "Thunder Nail".
 - 3. Demonstrate to the Architect that fasteners can be driven full length into concrete slab tight to stud track.
 - 4. Use similar fasteners (and spacing) suitable for steel at overhead track or weld track to overhead steel at 12" o.c.
 - 5. At track splices use anchored channel inserts or fully weld.

Spacing Schedule for Type A & B Fasteners

MAX. SPACING OF FASTENERS	*MAX. UNBRACED WALL HEIGHT	
	TYPE A	TYPE B
24"	7.4 FT.	8.3 FT.
16"	11.1 FT.	12.4 FT.
12"	14.8 FT.	16.5 FT.
8"	24.9 FT.	24.9 FT.
6"	29.7 FT.	33.2 FT.

*NOTE: Ceiling at wall does not reduce unbraced wall height.

B. STUD FASTENING: Each stud shall be fastened to top and bottom track (prior to gypsum board sheathing or interior wall finish) using one of the following two methods:

1. Screw fastening: One self-drilling screw at the front and back faces of the top and bottom tracks for each stud (4 fasteners per stud.)
2. Welding: One weld at the front face of the top and bottom tracks for each stud (2 welds per stud).
3. Additional: The above minimum fasteners are required regardless of any additional bracing or intermediate fastening which may be indicated in the drawings or required.

C. BRIDGING: Provide bridging at all exterior stud walls whether or not indicated in the drawings. Unless more stringent requirements are indicated in the drawings provide the following:

1. Wind loading resistance only: Provide multiple bridging rows spaced 5'-0" o.c. vertically maximum.
2. Axial loaded members: For stud lengths less than 10 feet, provide 2 rows of bridging at third points. For stud lengths 10 feet and greater, provide multiple bridging rows spaced 42" o.c. vertically maximum.

D. SHEATHING INSTALLATION: Apply sheathing panels horizontally with the "v" edge turned up. Install with joints and penetrations tight and neatly fit. Stagger end joints over studs with screws spaced at maximum 12" centers at each stud and at 12" o.c. along top and bottom runners.

END OF SECTION

SECTION 06 05 00 - DECORATIVE PLASTIC LAMINATE

PART 1 - GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

- A. Standard Decorative Laminates.
- B. Chemical Resistant Decorative Laminates.
- C. Moldings.
- D. Adhesives.

1.2 RELATED REQUIREMENTS

- A. Division 06: Wood, Plastics, and Composites (Interior Architectural Woodwork, Finish Carpentry, Architectural Wood Casework, Wood Paneling, Adhesives).
- B. Division 08: Interior Doors.
- C. Division 10: Interior Specialties (Toilet Partitions, Cubicles, Wall Paneling).
- D. Division 12: Furnishings (Laminate Clad Casework, Specialty Casework, Residential Casework or Office, Retail, Hospitality, Institutional Furniture).

1.3 REFERENCES

- A. Reference Standards: In addition to requirements, comply with applicable provisions of following for design, materials, fabrication and installation of component parts:
 1. NEMA LD3 - National Electrical Manufacturer Association.
 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 3. ASTM E162 - Surface Flammability and 662 Rate of Smoke Generation.
 4. U.S. Coast Guard – Conforms to IMO FTP Code Part 2 (smoke toxicity) and Part 5 (surface flammability).

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data:
 1. Submit product data, including manufacturer's technical data sheet for specified products, including literature for high-pressure decorative laminate, adhesive for bonding plastic laminate, and substrate information as related.
- C. Shop Drawings:

1. Submit shop drawings showing layout, profiles and product components, including edge conditions, panel joints, accessories, designs and textures.
- D. Samples:
 1. Submit selection and verification samples for product type, designs and textures.
- E. Quality Assurance Submittals:
 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
 2. Manufacturer's technical data sheets for laminate and adhesives.
 3. Manufacturer's Material Safety Data Sheets (MSDS).
 4. Certifications:
 - a. Recycled Content.
 - b. Forest Stewardship Council (FSC).
 - c. VOC compliance with local jurisdictions.
- F. Submit GREENGUARD Indoor Air Quality or SCS Indoor Advantage Gold Certificates showing compliance with VOC requirements.
- G. Maintenance: Submit 2 copies of manufacturer's Care and Maintenance Guide.

1.5 REGULARY REQUIREMENTS

- A. Adhesives:
 1. SCAQMD (South Coast Air Quality Management District).
 2. Ozone Transport Commission (OTC) model Rule for Adhesives and Sealants.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer Qualifications: Manufacturer producing product in ISO 9001 certified facility.
 2. Fabricator/Installer must be experienced in performing work of similar type and scope.
- B. Mock-Ups:
 1. Install at project site using acceptable products and manufacturer approved installation methods. Obtain Architect's acceptance of finish color, texture, pattern, fabrication, and installation standards. Comply with Division 01 Quality Control.
 2. Mock-Up Size: 24" x 24"
 3. Maintenance: Maintain mock-up during construction for fabrication and installation comparison. If required, remove and legally dispose of mock-up when no longer required.
 4. Incorporation: If allowed, mock-up may be incorporated into final construction upon Architect's approval.

1.7 DELIVERY, STORAGE & HANDLING

- A. Comply with Division 01 Product Requirements Sections.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- B. Adhesive: For best results, do not apply adhesives at temperatures below 65°F.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Wilsonart LLC
2400 Wilson Place
Temple, Texas 76503-6110
254.207.7000, 800.433.3222, F: 254.207.2384
www.wilsonart.com

- B. Substitutions: In Accordance with Section 01 25 00 Substitution Procedures

2.2 STANDARD DECORATIVE LAMINATES

- A. Acceptable Product: Wilsonart Laminate.
- B. Decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.
- C. General Purpose Type: Wilsonart Type 107, having the following physical characteristics:
 - 1. Sheet thickness: 0.048 inch nominal (1.22mm).
 - 2. Exceeding performance requirements of NEMA LD 3 current revision, Grade HGS.
 - 3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
 - 4. Patterns and Finishes: Selected from manufacturer's full range of available selections.
- D. Vertical Surface Type: Wilsonart Type 335, having the following physical characteristics:
 - 1. Sheet thickness: 0.028 inch nominal (0.71 mm).
 - 2. Exceeding performance requirements of NEMA LD 3 current revision, Grade VGS and VGP.
 - 3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
 - 4. Patterns and Finishes: Selected from manufacturer's full range of available selections.
- E. Postforming Type: Wilsonart Type 350, having the following physical characteristics:
 - 1. Sheet thickness: 0.039 inch nominal (1.00 mm).
 - 2. Exceeding performance requirements of NEMA LD 3 current revision, Grade HGP.
 - 3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
 - 4. Patterns and Finishes: Selected from manufacturer's full range of available selections.

2.3 CHEMICAL RESISTANT DECORATIVE LAMINATES

- A. Acceptable Products: Wilsonart Chemsurf Chemical-Resistant Laminate.
- B. Chemical resistant overlay and decorative alpha cellulose surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.
- C. Chemical Resistant Decorative Laminate: Wilsonart Type 390.
 - 1. Sheet thickness: 0.034 inch nominal (0.86 mm).
 - 2. Meeting bacterial resistance and susceptibility requirements of ASTM G 22.
 - 3. Patterns and Finishes: Selected from manufacturer's full range of available selections.

2.4 ACCESSORY MATERIALS

- A. Contact Adhesive:
 - 1. Non-postforming:
 - a. Wilsonart 1730/1731 Low VOC Contact Adhesive.
 - b. Wilsonart 730/731 Contact Adhesive, Low VOC canister.

2. Postforming:
 - a. Wilsonart H2O Contact Adhesive, water-based.
 - b. Water-resistant, non-staining bond for common high pressure laminate (HPL) applications.
- B. Cold Press PVA Adhesives
 1. Wilsonart 3100 PVA Adhesive: For bonding decorative laminate to wood products.
 2. Wilsonart 3105 PVA Adhesive: High solids, for bonding decorative laminate to wood products.
 3. Wilsonart 3116 PVA Adhesive: For bonding decorative laminate to wood products and bonding paper-backed products.
- C. Hot Press PVA Adhesives
 1. Wilsonart 3131 PVA Adhesive: High solids for bonding decorative laminates to wood products.
 2. Wilsonart 3132 PVA Adhesive: High solids for bonding decorative laminates to wood products.
- D. Postforming and Pinch Rolling PVA Adhesives
 1. Wilsonart 3000/3001 PVA Adhesive: High solids for bonding decorative laminate to wood products and postforming applications.

2.5 ADHESIVE APPLICATION EQUIPMENT

- A. Manual Spray:
 1. Binks
 2. Devilbiss
- B. Automatic Spray:
 1. Binks
 2. Devilbiss

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces for conditions that would adversely affect the performance of the decorative or edge performance.
- B. Surfaces to be adhesively bonded should be clean, dry and free of any dust, loose paint, wax, moisture, dirt, grease, oil, rust, or other contaminants.

3.2 PREPARATION

- A. Surface preparation: Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed installation instructions.
- B. Allow substrates to acclimate to room temperature for 48 hours before bonding.

3.3 INSTALLATION

- A. Install materials in accordance with AWS (Architect Woodwork Standards) and requirements of Section 06 40 00, Architectural Woodwork.

3.4 SPRAY APPLICATIONS

- A. Comply with adhesive manufacturers printed installation instructions.
- B. Apply adhesive uniformly to both surfaces and cover each surface a minimum of 80%.
- C. Apply two coats of adhesive to porous surfaces. 100% coverage is recommended for edges.
- D. Apply uniform downward pressure (30-40 psi minimum) across the entire bonded surface.

3.5 BRUSH APPLICATIONS

- A. Comply with adhesive manufacturers printed installation instructions.
- B. Apply adhesive with a brush or solvent-resistant medium nap roller. Apply adhesive uniformly to both surfaces and cover each surface 100%.
- C. Provide two coats of adhesive on porous surfaces. Double coat edges.
- D. Apply uniform downward pressure (30-40 psi minimum) across the entire bonded surface.

3.6 HAND APPLICATIONS

- A. Comply with adhesive manufacturers printed installation instructions

3.7 CLEANING AND PROTECTION

- A. Clean decorative plastic laminate in accordance with manufacturer's care and maintenance instructions.
- B. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install all rough carpentry, formwork, wood framing, blocking, wood furring, hardboard and related fasteners as indicated in the drawings or as required to complete the indicated construction.
- B. Install all related hardware and fasteners. Provide and install wood furring and/or trim for acoustical panels.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Cast-in place concrete
- B. Painting
- C. Finish hardware

1.4 SECTION REQUIREMENTS

- A. Submittals manufacturer's printed literature describing wood preservatives treatment system and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.
- B. Submittals manufacturer's printed literature describing fire retardant treatment system, any structural or usage limitations, and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 DELIVERY AND STORAGE

- A. Deliver and store lumber, plywood and hardwood on sills and cover for protection.

1.7 QUALITY ASSURANCE

- A. All lumber and plywood shall be grade marked by Southern Pine Inspection Bureau, West Coast Lumber Inspection Bureau, American Plywood Association, or Western Wood Products Association.
- B. All lumber and plywood shall be marked with producing manufacturer's trademark.
- C. Certificate of inspection issued by grading association for bundled lumber and plywood may substitute for individual piece marking.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Dressed lumber, S4S, [19] [15] percent maximum moisture content for **2-inch (38-mm)** thickness or less, marked with grade stamp of inspection agency.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPA C2 lumber and AWPA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:
 1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Concealed members in contact with masonry or concrete.
 3. Wood framing members less than **18 inches (460 mm)** above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- B. Fire-Retardant-Treated Materials: AWPA C20 lumber and AWPA C27 plywood, interior Type A treatment, labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Use treated lumber and plywood with bending strength, stiffness, and fastener-holding capacities that are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions.

2.3 LUMBER

- A. Miscellaneous Lumber: No. 3 or Standard grade of any species for nailers, blocking, and similar members as indicated on drawings.

2.4 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

1. Power-Driven Fasteners: CABO NER-272.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Hot-dip galvanized steel of structural capacity, type, and size indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. COORDINATION: Coordinate work with other trades and provide cutting and patching required to accommodate the work. Verify all dimensions by taking field measurements to ensure proper fit. Accurately cut framing and blocking, and fit true to line and level, avoiding shims and wedges.
- B. Fit rough carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.
- C. ANCHORING AND FASTENTING: Use largest practicable fasteners for each type of work. Bolt nailers and blocking to steel, masonry or concrete members using bolts of proportionate strength to members attached. Unless otherwise noted in the drawings use $\frac{3}{4}$ " diameter bolts at maximum 4'-0" centers. Use concealed fasteners in finish work, set nails and use flathead countersunk screws.
- D. WOOD BLOCKING: Install fire-retardant tread wood blocking between metal studs where wall-supported drinking fountains, casework, railings, and other equipment is attached. Install between studs for toilet partitions systems and toilet accessories where anchored to wall. Use minimum 2 x 4 dimension where not indicated otherwise in the drawings.

END OF SECTION

SECTION 06 16 43 - GYPSUM SHEATHING

PART 1 GENERAL

1.00 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

- A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.
- B. Related Sections:
 1. Section 05 41 00 Structural Metal Stud Framing.
 2. Section 06 10 00 Rough Carpentry.
 3. Section 09 21 16 Gypsum Board Assemblies.

1.02 REFERENCES

- A. ASTM International (ASTM):
 1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
 2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
 6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
 8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 10. ASTM C1396 Standard Specification for Gypsum Board
- B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.04 WARRANTY

- A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay) commencing with the date of installation of the product in such structure.
- B. Manufacturer's Warranty:
 - 1. Five years against manufacturing defects from the date of purchase of the product for installation
 - 2. 12 years against manufacturing defects when used as a substrate in architecturally specified EIFS.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Georgia-Pacific Gypsum LLC:
 - 1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Sheathing.
 - 2. Fiberglass-Mat Faced Gypsum Sheathing, Type X for Fire Rated Designs: DensGlass Fireguard Sheathing.
- B. Size:
 - 1. Thickness: 5/8 inch.
 - 2. Width: 4 feet.
 - 3. Length: 8 feet.
 - 4. R-Value: (ASTM C518) 0.67
- C. Substitutions will be in accordance with Section 01 25 00.

2.02 ACCESSORIES

- A. Screws: ASTM C1002, corrosion resistant treated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.02 INSTALLATION

- A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.
 - 1. Manufacturer's Recommendations:
 - a. Current "Product Catalog", Georgia-Pacific Gypsum.

3.03 PROTECTION

- A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK**PART 1- GENERAL****1.0 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim and rails.
 - 2. Wood cabinets (casework).
 - 3. Laminate clad cabinets (plastic-covered casework).
 - 4. Cabinet tops (countertops) and plastic-covered chair rails.
 - 5. Flush wood paneling.
 - 6. Interior door frames (jambs).
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 6 Section ‘Rough Carpentry’ for furring, blocking, and other carpentry work that is not exposed to view.
 - 2. Division 6 Section ‘Finish Carpentry’ for carpentry exposed to view that is not specified in this section.
 - 3. Division 6 Section ‘Exterior Architectural Woodwork’ for exterior woodwork.
 - 4. Division 8 Section “Flush Wood Doors” for doors specified by reference to architectural woodwork standards.
 - 5. Division 9 Section “Painting” for final finishing of installed painted finish architectural woodwork.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

- B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Fire-retardant treatment data for material impregnated by pressure process to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.
- D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- E. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.
 - 1. Plastic laminate (standard and premium selections).
- F. Samples for verification purposes of the following:
 - 1. Lumber with or for transparent finish, 50 square inches, for each species and cut, finished on one side and one edge.
 - 2. Veneer leaves representative of and selected from flitches to be used for transparent finished woodwork.
 - 3. Wood veneer faced panel products; with or for transparent finish, 8-1/2 inches by 11 inches, for each species and cut with one half of exposed surface finished, with separate samples of unfaced panel product used for core.
 - 4. Lumber and panel products with factory-applied opaque finish, 8- 1/2 inches by 11 inches for panels and 50 square inches for lumber, for each finish system and color, with one half of exposed surface finished.
 - 5. Laminate clad panel products, 8-1/2 inches, by 11 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
 - 6. Corner pieces as follows:
 - a. Cabinet front frame joints between stiles and rail as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 - 7. Exposed cabinet hardware, one unit of each type and finish.
- G. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.
- H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Single-Source Responsibility: Arrange for production by a single firm of architectural woodwork with sequence matched wood veneers.
 - 1. Include the veneering of wood doors in the single-firm production, where veneer matching extends across wood doors.

- C. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.
- D. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.
- E. AWI Quality Standard Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.
- F. Hardware Coordination Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.
- B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in 'Project Conditions.'

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
- B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2- PRODUCTS

2.01 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates (standard and premium selections) which may be incorporated in the work include:
 - 1. Formica Corp.
 - 2. Nevamar Corp.
 - 3. WilsonArt

2.02 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Medium Density Fiberboard: ANSI A208.2.
4. Particleboard ANSI A208.1
5. Softwood Plywood PS 1.

B. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:

1. Particleboard: NPA 8.
2. Medium Density Fiberboard: NPA 9.
3. Hardwood Plywood: HPMA FE.

C. Fire-Retardant Particleboard: Where indicated, provide panels complying with the following requirements that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for flame spread of 20 or less and for smoke developed of 25 or less per ASTM B 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. For 45-lb-density panels and thicknesses of 3/4 inch and less, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of elasticity and screw-holding capacity on face and edge shall be 300,000 psi, 250 lb, and 225 lb, respectively.
2. For 44-lb-density panels and thicknesses of 13/16 inch to 1-1/4 inch, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of rupture, modulus of elasticity, internal bond, linear expansion, and screw-holding capacity on face and edge shall be 1300 psi, 250,000 psi, 60 psi, 0.50 percent, 250 lb, and 175 lb, respectively.
3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Duraflake Div.; Willamette Industries, Inc.

2.03 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.
2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to minimum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.04 FIRE-RETARDANT-TREATED LUMBER

A. General: Where indicated, pressure impregnate lumber with fire-retardant chemicals of formulation indicated to produce materials with fire performance characteristics specified.

B. Fire-Retardant Chemicals: Use chemical formulations specified that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.

1. Organic Resin-Based Formulation: Exterior type per AWPA C20 consisting of organic-resin solution, relatively insoluble in water, thermally set in wood by kiln drying.
2. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.

C. Fire Performance Characteristics: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.

1. Surface Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion.
 - a. Flame Spread: 25.
 - b. Smoke Developed: 50.

D. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting organization.

E. Mill lumber before treatment and implement special procedures during treatment and drying processes that are needed to prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

F. Kiln-dry woodwork after treatment to levels required for untreated woodwork. Maintain moisture content required by kiln drying before and after treatment.

G. Discard treated lumber that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

H. Products: Subject to compliance with requirements, provide one of the following:

1. Low-Hygroscopic Formulation (Type A):
 - a. "Flameproof LHC"; Osmose Wood Preserving, Inc.
 - b. "Dricon"; Hickson Corporation.

2.05 STANDING AND RUNNING TRIM AND RAILS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 300.

- B. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.
- C. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- D. Grade: Premium.
- E. Lumber Species: Birdseye Maple, half round.

2.06 STANDING AND RUNNING TRIM AND RAILS FOR OPAQUE FINISH

- A. Quality Standard: Comply with AWI Section 300.
- B. Grade: Premium.
- C. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.
- D. Assemble casing in plant except where limitations of access to place of installation require field assembly.
- E. Lumber Species: Any dosed-grain hardwood listed in referenced woodworking standard.

2.07 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 400 and its Division 400A Wood Cabinets.”
- B. Grade: Premium.
- C. AWI Type of Cabinet Construction: Flush overlay.
- D. Wood Species for Exposed Surfaces: Maple, rotary cut veneer.
 - 1. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.
 - 2. Matching of Veneer Leaves: Slip match.
 - 3. Veneer Matching Within Panel Face: Balance match.
- E. Wood Species for Semiexposed Surfaces: Match species and cut indicated for exposed surfaces.

2.08 LAMINATE CLAD CABINETS (PLASTLC.COVERED CASEWORK)

- A. Quality Standard. Comply with AWI Section 400 and its Division 400B ‘Laminate Clad Cabinets.”
- B. Grade: Premium.
- C. AWI Type of Cabinet Construction: Flush overlay, unless otherwise indicated.
- D. Laminate Cladding High pressure decorative laminate complying with the following requirements:
 - 1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - a. Provide selections made by Architect from laminate manufacturer’s full range of standard and premium colors and finishes in the following categories:

- (1) Solid colors.
- (2) Patterns.
2. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
 - a. Horizontal Surfaces Other Than Tops: GP-50 (0.050-inch nominal thickness).
 - b. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
 - c. Edges: GP-50 (0.050-inch nominal thickness).
3. Semiexposed Surfaces: Provide surface materials indicated below:
 - a. High pressure laminate, GP-28.

2.09 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section 'Door Hardware.'
- B. Cabinet Hardware and Miscellaneous Item Schedule:
 1. Adjustable Shelf Standard:
 - a. Manufacturer/Model No.: Knappe & Vogt/No. 255.
 - b. Size/Type: 5/8" wide x 3/16" deep, recessed.
 - c. Finish: Bright zinc plate.
 - d. Remarks: 1/2" vertical adjustment.
 2. Adjustable Shelf Support:
 - a. Manufacturer/Model No.: Knappe & Vogt/No. 256.
 - b. Finish: Bright zinc plate.
 - c. Remarks: For use with No. 255 standard.
 3. Slotted Shelf Standard:
 - a. Manufacturer/Model No.: Knappe & Vogt/No. 51.
 - b. Size/Type: 3/4" x 3/8" x length shown, surface mount, heavy duty.
 - c. Finish: Bright nickel plate.
 - d. Remarks: 1-5/8" vertical adjustment.
 4. Adjustable Shelf Bracket:
 - a. Manufacturer/Model No.: Knappe & Vogt/No. 52.
 - b. Size/Type: 112" wide x shelf depth.
 - c. Finish: Bright nickel plate.
 - d. Remarks: For use with No.51 standard.
 5. Drawer Slide: (Typical)
 - a. Manufacturer/Model No.: Grant/No. 329.
 - b. Size/Type: Full extension, length to suit drawer.
 - c. Finish: Zinc plate.
 - d. Remarks: 100 lb. rating.
 6. Drawer Slide: (To 4-1/2" drawer depth)

- a. Manufacturer/Model No.: Grant/No. 328.
- b. Size/Type: Full extension, length to suit drawer.
- c. Finish: Zinc plate.
- d. Remarks: 50 lb. rating.

7. Knobs (at Suites Level):

- a. Forms + Surfaces Model No. HC430 Series, sizes as selected by Architect from manufacturers standards.
- b. Finish: Anodized black matte.

8. Wire Pulls:

- a. Manufacturer/Model No.: Stanley/No. 4483112
- b. Size/Type: 3-1/2" center wire pulls.
- c. Finish: US 28D.

9. Concealed Hinges:

- a. Manufacturer/Model No.: Stanley/No. 1510.

10. Continuous Hinges:

- a. Manufacturer/Model No.: Stanley/No. STS311-1/4.
- b. Size/Type: 1-1/2" wide x height of door.
- c. Finish: US 32.
- d. Remarks: Provide matching countersunk screws, 2" o.c., both sides.

11. Door Catch (Magnetic type)

- a. Manufacturer/Model No.: Stanley/No. SP4L
- b. Size/Type: 2" x 1-1/4" case size.
- c. Finish: Aluminum.
- d. Remarks: One per leaf to 48", two per leaf to 84".

12. Cabinet Lock

- a. Manufacturer/Modal No.: National/No. C-8053.
- b. Size/Type: Disc tumbler cam lock.
- c. Finish: US 26D or US 32D.
- d. Remarks: Furnish two keys per lock; keyed to Building Standard.

13. Sliding Glass Door Locks: K&V 965NP, keyed to building system.

14. Track, Upper Guide & Sheaves: Stylmark Model No. 810005 Assembly, 204-Ri clear anodized finish.

C. Hardware Standard Comply with ANSI/BEMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BIIMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

1. Dark Oxidized Satin Bronze, Oil Rubbed, on Bronze Base: BHMA 613 and matching Architect's sample.
2. Satin Chromium Plated, Brass or Bronze Base: BHMA 626.

3. Satin Chromium Plated, Steel Base: BHMA 652.
4. Satin Stainless Steel, Stainless Steel Base: BHMA 630.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSJ/BHMA A156.9.

F. Clear Tempered Float Glass for Shelves: ASTM C 1048, Condition A, style I, type I, quality q3, class 1, seamed at edges before tempering, 1/4-inch thick unless otherwise indicated.

2.10 ARCHITECTURAL CABINET TOPS (COUNTERTOPS) AND CHAIR RAILS:

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top and Chair Rail: High pressure decorative laminate complying with the following:

1. Grade: Custom.
2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:
 - a. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - (1) Provide selections made by Architect from manufacturer's full range of standard and premium colors and finishes in the following categories:
 - (a) Solid colors.
 - (b) Patterns.
 - b. Grade: GP-50 (0.050-inch nominal thickness).
 - c. Edge Treatments:
 - (1) Plastic Laminate Edge Treatment: Same as laminate cladding on horizontal surfaces.
 - (2) Wood Edge Treatment: Lumber edge for transparent finish, with matching wood species and cut to be determined.

2.11 FLUSH WOOD PANELING FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 500 and its Division 500A.

B. Grade: Premium.

C. Veneer Species: Birdseye Maple half round.

D. Matching of Adjacent Veneer Leaves: Slip match.

E. Veneer Matching Within Panel Face: Best match.

F. Fire Performance Characteristics: Provide paneling composed of panels of wood veneer density and fire-retardant particleboard that are identical in construction to units tested for the following surface burning characteristics per ASTM E 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify panels with appropriate markings of applicable testing and inspecting organization on surfaces that will be concealed from view after installation.

1. Flame Spread: 75 or less.
2. Smoke Developed: 40 or less.

2.12 INTERIOR DOOR FRAMES FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 900B.
- B. Grade: Premium.
- C. Lumber Species: Maple, rotary cut veneer.

2.13 CLOSET AND UTILITY SHELVING:

- A. Quality Standard: Comply with AWI Section 600.
- B. Shelving for Painted Finish (By Section 09 91 00): Comply with the following requirements:
 - 1. Grade: Economy.
 - 2. Shelving Material: Maple faced veneer core plywood.
 - 3. Lumber: Ponderosa Pine or Poplar.

2.14 FASTENERS AND ANCHORS

- A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
 - 1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.15 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

- A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.
- B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.
 - 1. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation. Painted finish by Section 09 91 00 except prime coat.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.
- D. Transparent Finish for Closed-Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect, and sheen.
 - 1. Grade: Premium.
 - 2. AWI Finish System #5: Catalyzed polyurethane.
 - 3. Staining for Cherry Only: Match approved sample for color.
 - 4. Effect: Open grain (not filled).
 - 5. Sheen: Dull satin 15-20 deg.

E. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen:

1. Grade: Premium.
2. AWI Finish System #11: Catalyzed polyurethane.
3. Color: Match Architect's sample.
4. Sheen: Medium-gloss rubbed effect 35-45 deg.

2.16 MISCELLANEOUS ACCESSORIES

A. Steel Countertop Support Bracket: provide prefinished steel bracket supports at locations as shown on drawings. Brackets shall be by A&M Hardware (888) 647-0200 info@aandmhardware.com Other equal products may be provided if and as specifically approved by Architect by substitution request during bidding period.

PART 3- EXECUTION

3.01 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

- B. Quality Standard. Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.
- C. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 118 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.
- D. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood. Handle, store, and install fire- retardant-treated wood to comply with recommendations of chemical treatment manufacturer including those for adhesives where are used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- G. Standing and Running Trim and Rails: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns and miter at corners.

- H. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish
- I. Tops: Anchor securely to base units and other support systems as indicated.
- J. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
- K. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.
- L. Refer to the Division 9 sections for finishing of painted architectural woodwork.

3.03 ADJUSTMENT AND CLEANING

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 06 61 16 - SOLID SURFACING

PART 1 – GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

- A. Section Includes:
 - 1. Gibraltar Solid Surface Material.
 - 2. Earthstone Solid Surface Material.
 - 3. Solid Surface Material Shaped Goods (Wilsonart Sinks).
- B. Related Sections:
 - 1. Finish Carpentry: Section 06 10 00.
 - 2. Architectural Woodwork: Section 06 40 23.
 - 3. Sealants: Section 07 92 00.
 - 4. Door Thresholds at Ceramic Tile: Section 09 30 13.
 - 5. Plumbing: Division 22.

1.2 SYSTEM DESCRIPTION

- A. Gibraltar Solid Surface Sheet: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.
- B. Earthstone Solid Surface Sheet: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.
- C. Solid Surface Shaped Goods (Wilsonart Sinks): Cast items of homogenous material composed of polyester and acrylic resins, fire-retardant filler materials, and coloring agents.

1.3 SUBMITTALS

- A. Comply with Section 01 33 00, unless otherwise indicated.
- B. Product Data:
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
 - 3. Manufacturer's detailed recommendations for handling, storage, installation, protection, and maintenance.

- C. Shop Drawings: Installation details including location and layout of each type of fabrication and accessory.
- D. Samples: Full range of standard colors and patterns.
- E. Contract Closeout Submittals: Comply with Contract Documents.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Wilsonart certified solid surface fabricator/installer.
- B. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, including specific requirements indicated.
 - 1. Acceptable to or licensed by manufacturer.
- C. Source Limitations: Obtain materials and products from single source.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fabrications appropriately wrapped in protective materials.
- B. Protect fabrications from damage.

1.6 PROJECT CONDITIONS

- A. Maintain relative humidity planned for building occupants and an ambient temperature between 65 and 75 $^{\circ}\text{F}$ for 48 hours prior to and during installation. After installation, maintain relative humidity and ambient temperature planned for building occupants.

1.7 WARRANTY

- A. Furnish manufacturer's limited 10 year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Wilsonart International, (800) 433-3222, www.wilsonart.com.
 - 1. Gibraltar Solid Surface, Type 051.
 - 2. Earthstone Solid Surface, Type 051.
- B. Substitutions: Permitted, in accordance with Section 01 25 00 Substitution Procedures.

2.2 GIBRALTAR SOLID SURFACE SHEET

- A. Nominal sheet thickness: 0.50 inch (13 mm)
- B. Surface burning characteristics in accordance with ASTM E 84: Class I or A, and as follows:
 - 1. Flame spread: < 25.
 - 2. Smoke developed: <25.
- C. Liquid Absorption, ISO 4586-2, for 1/2 inch material thickness: 0.4 percent after 2 hour period.
- D. Izod Impact, ASTM D 256, Method A: 0.3 foot pounds per inch.

- E. Tensile Modulus, ASTM D 638 Nominal: 1.2 million pounds per square inch.
- F. Thermal Expansion, ASTM D 696: 0.000018 inch per inch per degree F, maximum.
- G. Hardness, ASTM D 2583, Barcol Impressor: 57.
- H. Flexural Toughness, ASTM D 790: 3 (in.-lb./in³).
- I. Deflection Temperature under load, ASTM D 648: 90 degrees C.
- J. Stain Resistance, ANSI Z-124.3 Modified; 3.4: No effect.
- K. Boiling Water Resistance, NEMA LD 3-3.05: No effect.
- L. High Temperature Resistance, NEMA LD 3-3.06: No effect.
- M. Radian Heat Resistance, NEMA LD 3-3.10: No effect.
- N. Light Resistance, NEMA LD 3-3.03: No effect.
- O. Ball Impact Resistance, NEMA LD 3-3.08, one half pound ball, unsupported: 125 inches.
- P. Specific Gravity (Density ASTM D792): 1.60 grams per cubic centimeter.
- Q. Approximate weight: 4.20 pounds per square foot.
- R. Weatherability, ASTM D 2565: Pass.
- S. Fungus Resistance, ASTM G 21: Pass.
- T. Bacterial Resistance, ASTM G 22: Pass.
- U. Pittsburgh Protocol Toxicity: 66.9 grams.
- V. Patterns and Finishes: Selected from manufacturer's full range of available selections (*standard*) by Architect.

2.3 EARTHSTONE SOLID SURFACE SHEET

- A. Nominal sheet thickness: 0.50 inch (13 mm).
- B. Surface burning characteristics in accordance with ASTM E 84: Class II or B, and as follows:
 - 1. Flame spread: < 26.
 - 2. Smoke developed: < 35.
- C. Liquid Absorption, ISO 4586-2, for 1/2 inch material thickness: 0.4 percent after 2 hour period.
- D. Izod Impact, ASTM D 256, Method A: 0.3 foot pounds per inch.
- E. Tensile Modulus, ASTM D 638 Nominal: 1.1 million pounds per square inch.
- F. Thermal Expansion, ASTM D 696: 0.000002 inch per inch per degree F, maximum.
- G. Hardness, ASTM D 2583, Barcol Impressor: 57.
- H. Flexural Toughness, ASTM D 790: 5 (in.-lb./in³).
- I. Deflection Temperature under load, ASTM D 648: 90 degrees C.
- J. Stain Resistance, ANSI Z-124.3 Modified; 3.4: No effect.
- K. Boiling Water Resistance, NEMA LD 3-3.05: No effect.
- L. High Temperature Resistance, NEMA LD 3-3.06: No effect.
- M. Radian Heat Resistance, NEMA LD 3-3.10: No effect.
- N. Light Resistance, NEMA LD 3-3.03: No effect.
- O. Ball Impact Resistance, NEMA LD 3-3.08, one half pound ball, unsupported: 125 inches.
- P. Specific Gravity (Density ASTM D792): 1.56 grams per cubic centimeter.
- Q. Approximate weight: 4.10 pounds per square foot.
- R. Fungus Resistance, ASTM G 21: Pass.
- S. Bacterial Resistance, ASTM G 22: Pass.
- T. Pittsburgh Protocol Toxicity: 65.4 grams.
- U. Patterns and Finish: Selected from manufacturer's full range of available selections (*standard*) by Architect.

2.4 ACCESSORY MATERIALS

- A. Joint adhesive: Manufacturer's standard adhesive to create inconspicuous, nonporous joints, with a chemical bond (WA8215).
- B. Sealant: Standard mildew resistant, FDA/UL recognized silicone sealant in color matched or clear formulations.

- C. Sink/bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.5 FABRICATION

- A. Fabrication to be performed by a Wilsonart certified solid surface fabricator/installer.
- B. Fabricate components in shop to greatest extent practical to size and shape indicated, in accordance with approved shop drawing and Wilsonart published requirements.
- C. Wilsonart Solid Surface Fabrication Manual (SS0319)
- D. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 4" (100mm) wide Gibraltar/Earthstone reinforcing strip under joints required by Deck Seam Section of the Wilsonart Solid Surface Fabrication Manual (SS0319).
- E. Provide holes and cutouts for plumbing and bath accessories as indicated on shop drawings.
- F. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts then sand all edges smooth. Repair or reject defective or inaccurate work.
- G. Finish: Surfaces shall have a uniform finish.
 - 1. Matte: Standard finish for high traffic areas, requires the least amount of maintenance.
 - 2. Satin: Standard finish for darker Gibraltar and Earthstone patterns, requires minimal maintenance.
 - 3. Semi-gloss: Higher sheen with greater reflectance, suggested for lower traffic areas, requires increased maintenance
 - 4. Gloss: Maximum sheen and reflectance, recommended for light traffic areas or vertical applications.
- H. Thermoforming (optional): Comply with forming data from manufacturer.
 - 1. Construct matching molds to form components shape.
 - 2. Form pieces to shape prior to seaming and joining.
 - 3. Cut pieces larger than finished dimensions, sand edges, remove all nicks and scratches.
 - 4. Heat entire component uniformly between 280°–325°F during forming.
 - 5. Prevent blistering, whitening or cracking of Gibraltar/Earthstone during forming.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surfacing. Identify conditions detrimental to proper or timely installation. Do not commence installation until conditions have been corrected.

3.2 PREPARATION

- A. Precondition Wilsonart Solid Surfacing in accordance with manufacturer's printed installation instructions.

3.3 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings, project installation details and manufacturer's printed instructions.
- B. Form joints using manufacturer's approved adhesive, with joints inconspicuous in finished work.
- C. Adhere undermount sinks/bowls to countertop using manufacturer's recommended joint adhesive.
- D. Adhere topmount sinks/bowls to countertop using manufacturer's recommended adhesive/silicone sealant.
- E. Provide backsplashes and endsplashes as indicated on the drawings. Adhere to countertops using

manufacturer's recommended silicone sealant.

- F. Remove excessive adhesive and sealants. Components shall be clean on Date of Substantial Completion.
- G. Coordinate plumbing installation with Division 22.

3.4 INSTALLATION OF WINDOW STOOLS

- A. Install window stools full length of window, set securely into place using only concealed fasteners and manufacturer's approved adhesive.
- B. Window stools shall be plumb, true and level.
- C. Provide minimum 1/8" expansion gaps on both sides of window stools, sealed with Manufacturer's approved sealant.
- D. Ease edges and sand smooth.

3.5 INSTALLATION OF VANITIES

- A. Install plumb, level, true and straight. Shim as necessary using concealed shims.
- B. Attach top securely to base unit or support brackets in accordance with manufacturer's printed instructions.
- C. Seal between wall and component with manufacturer's recommended silicone sealant.
- D. Attach backsplashes and endsplashes to countertops using manufacturer's recommended silicone sealant.

3.6 PROTECTION

- A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged components that cannot be repaired to architect's satisfaction.
- B. Fabricator/Installer to provide the Wilsonart® Care and Maintenance kit, review maintenance procedures and the Wilsonart warranty with the head of maintenance upon completion of project.

END OF SECTION

SECTION 07 10 00 — DAMPROOFING AND WATERPROOFING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install below-grade waterproofing.
- B. Provide and apply dampproofing on weather side of inside wythe of all exterior masonry cavity walls.
- C. Provide and apply dampproofing and joint taping on weather side of gypsum board sheathing.
- D. Provide and install membrane waterproofing (flashing) at exterior walls as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Unit masonry.
- B. Gypsum sheathing.
- C. Flashing at roof.
- D. Plastic membrane under slab-on-grade.
- E. Waterstops.
- F. Metal thru-wall flashing.

1.4 SUBMITTALS

- A. Submit manufacturer's printed literature describing each material, restrictions, and manufacturer's recommended procedures. Submit samples of each material.

B. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the Work under this section for a period of one year after the date of Substantial Completion of the Project.

1.6 QUALITY ASSURANCE

A. Waterproofing company shall have a minimum of 3 years experience in the dampproofing and waterproofing of building structures of similar size and scope as this project.

B. Retain at the job site a properly calibrated gauge for use by the Architect to verify applied thickness of materials.

PART 2 - PRODUCTS

2.1 WALL MATERIALS

A. MEMBRANE FLASHING: 40 mil thick polyethylene backed SBS modified bitumen self-adhering black membrane; "Protecto Flash" as manufactured by Protecto Wrap Co. or "Perm-A-Barrier" as manufactured by W.R. Grace and Co. or "Blueskin SA" as manufactured by Henry Company. Membrane shall comply with the following:

1. Tensile Strength: ASTM D412; 1400 psi.
2. Elongation: ASTM D412; 200% min.
3. Water Absorption: ASTM D570; 0.1% max.

B. DAMPROOFING: Non-asbestos emulsion type coating No. 352 over No. 207 adhesive primer, as manufactured by Gulf States Asphalt or approved equivalent by Henry Company, Karnak, W.R. Meadows, Celotex, or Sonneborn. Comply with ASTM D1227, Type 1.

C. SHEATHING TAPE: 4" wide glass fabric scrim complying with ASTM D1668 or 40 mil thick polyethylene backed SBS modified bitumen self-adhering tape as manufactured by Protecto Wrap Co. or equivalent by W.R. Grace and Co or Henry Company. Verify compatibility of tape with proposed dampproofing.

2.2 BELOW GRADE WATERPROOFING:

A. WALLS: "Hydrocide Liquid Membrane 5000T", one part cold applied elastometric, modified urethane. Trowel applied, non-sag, as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

B. SLABS: "Hydrocide Liquid Membrane, HLM 5000" Cold Applied Seamless Elastomeric, Modified Urethane for use between concrete seal slab and concrete slab-on-grade as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

C. PROTECTION BOARD: Water-resistant, semi-rigid panel composed of a core of asphalt and inorganic mineral filler particles, bottom reinforcing cover of asphalt-saturated felt and top cover of fiber glass mat weather-coated with a bond-breaking film, as manufactured by W.R. Meadows, Inc or Henry Company.

- D. INSIDE ELEVATOR PIT: "Sonoblock" cementitious base slurry as manufactured by Sonneborn-Contech.
- E. WATERSTOPS: Reference concrete section.

2.3 SHOWER PANS:

- A. MEMBRANE SHOWER PAN: 30 mil thick synthetic, heavy-duty, flexible membrane PVC sheet, Nervastral 300.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor shall inspect exterior face of all masonry cavity walls to ensure that all penetrations and joints are completely filled prior to dampproofing operations beginning.

3.2 MEMBRANE FLASHING

- A. Prime concrete and masonry surfaces scheduled to receive membrane flashing using flashing manufacturer's recommended primer to ensure good adhesion.
- B. WALL FLASHINGS: Shall be installed above all openings occurring in an exterior wall, at base of exterior wall, and at wall interruptions by columns, beams, slabs, spandrels and other locations as indicated in the drawings. Flashing shall extend to within 1" of outside face of wall, shall be continuous and shall extend through cavity and be turned up to the top first course above finish floor on face of inner wythe, and to extend 1" minimum into back up or inner wythe. End laps to be 9" and side laps 6".
- C. STEEL STRUCTURE: Cover all steel columns or beams in exterior walls not protected by dampproofed concrete block or sheathing. Cover steel completely with membrane flashing lap 6" on to masonry on each side of columns. Conform and adhere to steel shapes not fireproofed. Cover all protruding angles or miscellaneous steel.
- D. FRAMES: Install at exterior window and door frames and other locations as indicated in the drawings.
- E. SHEATHING: Wrap all corners of gypsum board sheathing. See drawings for other details.

3.3 SHEATHING TAPE: Use one of the following systems:

- A. Imbed and cover glass fabric scrim tape in dampproofing mastic at all joints, cracks and penetrations at gypsum board sheathing.
- B. Apply specified self-adhering tape continuously over all joints, cracks and penetrations prior to beginning dampproofing operations.

3.4 DAMPROOFING

- A. Spray or brush apply dampproofing coating to weather side of all gypsum sheathing and primed concrete block back-up at exterior masonry cavity walls in accordance with the following:
 1. Primer: Minimum $\frac{1}{2}$ gallon material per 100 sq. ft. of wall surface.
 2. Coating: Minimum $\frac{2}{32}$ " (62.5mils) dry film thickness and minimum 5 gallons material per 100 sq. ft.
- B. Cover all corners and work thoroughly into all joints, cracks, or crevices. Finished coating shall be monolithic and free of pin holes or cracks. Seal cracks, voids and joints at dissimilar materials with glass fabric embedded in dampproofing coating.
- C. Seal around penetrations including all masonry anchors.
- D. Dampproofing shall be applied only when temperature is at 50 degrees F. and rising or above, and when no rain is forecast for the 24 hour period following application. No dampproofing shall be covered by masonry prior to observation by the Architect. All dampproofing shall dry for a minimum of 24 hours prior to being covered by finish masonry.

3.5 BELOW GRADE WATERPROOFING

- A. LIQUID MEMBRANE:
 1. Install liquid membrane systems at earth side of all below grade walls, between sub-slab ("mud-slab") and structural slab, and all outside surfaces of elevator pit. Allow concrete work to cure a minimum of 14 days. All surfaces shall be smooth, dry, sound and free of honeycombs. Concrete shall be free of curing and parting compounds, wax or other foreign materials.
 2. Static joints or cracks less than $\frac{1}{8}$ " wide shall be sealed with "HLM" as manufactured by waterproofing manufacturer. Material shall fill and over-lap the edges of the joint to a width of 4" on both sides and shall have a minimum surface thickness of 55 (+5) mils.
 3. Immediately prior to application of membrane, remove all dust and dirt by use of high-pressure air, by brushing with a soft broom or vacuum cleaning.
 4. Apply material at a rate of 4 gallons per 100 square feet of surface to produce a membrane of 55 (+5) mil thick. Carefully control application to avoid runs and sags of fresh material.
 5. Apply membrane to prestripped areas at cracks, joints, intersections, penetrations, etc., to provide a minimum total thickness of 110 mils over these areas. Mask any membrane edge exposed to view to provide a straight clean edge.
 6. Before the membrane attains a final set, verify the applied thickness by use of a mil-thickness gauge. Where readings indicate a thickness less than specified, immediately apply additional membrane to produce required thickness.
 7. Following the application of the membrane, place protection boards over the membrane waterproofing at walls receiving backfill. Use membrane material as required to adhere protection boards. Boards shall be firmly in place with joints closely butted and sealed with gusset tape before backfilling is started.
 8. Protect membrane during construction. Any punctures or cuts in the membrane shall be patched and sealed in the manner described above for sealing joints in the sheeting.

3.6 SHOWER PANS

1. Ensure that surfaces receiving shower pan are clean, thoroughly dry and free from rough surfaces and sharp projections.
2. One-ply of 30 mil sheet shall be applied over concrete surface by embedding it in a coat of Nerva-Plast mastic trowel-applied at a rate of 40 sq. ft. per gallon. Turn up perimeter a minimum of 4".
3. Seal joints with 3" and final 2" wide strips of Nervastral tape in accordance with manufacturer's recommendations. Preform all corners and make without joints.
4. Roll entire horizontal area with 50 to 100 lb. Roller. Set corners and turn-ups with rubber roller.

END OF SECTION

SECTION 07 21 00 - BUILDING INSULATION

PART 1 - GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Polystyrene foam insulation
 - 2. Open cell spray foam insulation
 - 3. Chicken Wire
 - 4. Fiberglass roll or batt insulation
 - 5. Polyencapsulated Batt Insulation
 - 6. Fiberboard ceiling insulation underlayment
- B. Related Sections include the following:
 - 1. Section 09 21 16.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

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, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Tenneco Building Products.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type X, 1.30 lb/cu. ft.

C. Open Cell Spray Foam Insulation:

1. Icynene LD-R-50
2. Demilec Sealection 500
3. Application: Exterior Walls and other locations as indicated on plans.

D. Polyencapsulated Batt Insulation

1. Johns Manville
2. Owens Corning
3. Certainteed

Encapsulated, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Roof/Ceiling Cavity: R-19
2. Exterior Walls: R-19

E. Batt or Roll Insulation:

1. Johns Manville
2. Owens Corning
3. Certainteed

General: Insulation shall be fine fiber, flexible, resilient glass fiber blanket. Moisture absorption shall be less than .2% by volume.

1. Interior Stud Walls: 3 5/8" x 16" wide x 96" sound attenuation batts "R" factor 11. Unfaced.
2. Interior Stud Walls: 6" x 16" wide x 96" sound attenuation batts "R" factor 19. Unfaced
3. Above Acoustical Ceilings: 6" x 24" wide x 96" thermal batt insulation kraft faced fiberglass. "R" factor 19

AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Chicken Wire: Provide as support for encapsulated batt insulation attached to the underside of metal building roof z girts.
- C. Fiberboard ceiling insulation underlayment: Provide over scheduled ceilings as substrate to apply sprayed foam insulation. Provide Celotex or equivalent product.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Review and insure chemical compatibility of cavity wall damp proofing membrane and cavity rigid insulation board prior to installation.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.
- B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless steel screens (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturers written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are required to make up total thickness.

3.4 INSTALLATION OF FOAM INSULATION

- A. Per manufacturer's instructions. Installation by approved applicator only.

3.5 INSTALLATION OF CAVITY WALL INSULATION

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against sheathing.

3.6 INSTALLATION OF POLYENCAPSULATED BATTS

- A. Encapsulated batts at vertical wall surfaces are to be attached with self tapping screws where attached at z girts. Batts at metal stud wall shall form fit to cavity.

3.7 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor-retarder-faced units with vapor retarder to warm side of construction. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- C. Apply spray foam insulation in strict compliance with insulation manufacturers' written recommendations by manufacturer approved applicator only. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even with studs by using method recommended by insulation manufacturer.

END OF SECTION

SECTION 07 21 19 - FOAMED-IN-PLACE MASONRY WALL INSULATION

PART 1 - GENERAL

1.00 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 1. Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.02 SUBMITTALS

- A. Product and technical presentation as provided by the manufacturer.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CFR 1910 1200.

1.03 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
- B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.
- C. Warranty: Upon request, a one year product and installation warranty will be issued by both the manufacturer and installer.

D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

Product must be classified by Underwriters Laboratory ® ("UL") as to Surface Burning Characteristics

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Combustion Characteristics:	ASTM E-136

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:

- "Core-Fill 500™"; Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28603, (800) 627-1687
- Or approved equal.

2.02 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

- Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-119) for 8" and 12" concrete masonry units when used in standard two (2) hour rated CMUs.
- Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
- Combustion Characteristics: Must be noncombustible, Class A building material.
- Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
- Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E 90-90).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Application Assemblies:

Block Walls:	6", 8", 10" or 12" concrete masonry units
Cavity Walls:	2" cavity or greater

3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

END OF SECTION

SECTION 07 21 29 - SPRAY FOAM INSULATION

PART 1 GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply

1.2 SECTION INCLUDES

- A. Open Cell Spray Foam Insulation.

1.3 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete.
- B. Section 07 10 00 - Dampproofing and Waterproofing: Insulation installed with waterproofing systems.
- C. Section 07 26 00 - Vapor Retarders: Vapor retarder materials.
- D. Section 07 27 00 - Air Barriers: Air seal materials.
- E. Section 07 24 00 - Exterior Insulated Finish Systems EIFS.

1.4 REFERENCES

- A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- C. ASTM C 1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building

Materials.

- E. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- F. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- H. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- I. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- J. ASTM D 2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- K. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

1.5 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.
- B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Storage: Store materials in dry locations with adequate ventilation, protected from freezing rain, direct sunlight and excess heat and in such a manner to permit easy access for inspection and handling. Store at temperature between 55 and 80 degrees F (12.7 to 26.6 degrees C).
- C. Handling: Handle materials to avoid damage.

1.9 PRE-APPLICATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

1.10 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply insulation when substrate temperatures are under 40 degrees F (4.4 degrees C) prior to installation.
- C. Surfaces must be dry prior to application of spray foam. Excess humidity may cause poor adhesion, and result in product failure.
- D. To avoid overspray, product should not be applied when conditions are windy.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 750 E. Swedesford Rd. P. O. Box 860 ; Valley Forge, PA 19482-0860; Toll Free Tel: 800-233-8990; Fax: 610-341-7940; Email: [request info](#); Web: certainteed.com/CertainTeed/Pro/Design+Professional/Insulation
- B. Substitutions: Approved Equal.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 SPRAY FOAM INSULATION

A. Insulation: Polyurethane water-blown type Open Cell Foam: CertainTeed CertaSpray Open Cell Foam is a low density, MDI-based semi-rigid polyurethane foam:

1. Physical and Mechanical Properties:
 - A. Core Density: 0.45-0.55 pcf when tested in accordance with ASTM D 1622.
 - B. Thermal Resistance: 3.6 when tested in accordance with ASTM C 518 at 75 degrees F, (h-ft²- degrees F)/Btu.
 - C. Open Cell Content: Greater than 95 percent when tested in accordance with ASTM D 2842.
 - D. Compressive Strength: Greater than 2.4 psi when tested in accordance with ASTM D 1621.
 - E. Tensile Strength: 5.2 psi when tested in accordance with ASTM D 1623.
 - F. Water Absorption: Less than 30 percent by volume when tested in accordance with ASTM D 2842.
 - G. Dimensional Stability: Less than 12 percent by volume when tested in accordance with ASTM D 2126 at 75 degrees F/95 percent RH, 28 Days.
 - H. Water Vapor Transmission: 33 perm/inch when tested in accordance with ASTM E 96.
 - I. Air Permeability: 0.013 when tested in accordance with ASTM E 283 at 5-1/2 inch thickness, L/s/m².
 - J. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.
2. Fire performance
 - A. Flame Spread: Less than 25 when tested in accordance with ASTM E 84.
 - B. Smoke: Less than 350 when tested in accordance with ASTM E 84.
3. Thermal Performance: Tested in accordance with ASTM C 518 and/or ASTM C 177 at 75 degrees F (24 degrees C) mean temperature.
 - A. Thickness 1 inch (25 mm), R-Value 3.6 (h-ft²-degreesF)/Btu (0.6 (m²-degreesC)/W).
 - B. Thickness 1-12 inches (38 mm), R-Value 5.4 (h-ft²-degreesF)/Btu (1.0 (m²-degreesC)/W).
 - C. Thickness 2 inches (51 mm), R-Value 7.2 (h-ft²-degreesF)/Btu (1.3 (m²-degreesC)/W).
 - D. Thickness 2-12 inches (64 mm), R-Value 9.0 (h-ft²-degreesF)/Btu (1.6 (m²-degreesC)/W).
 - E. Thickness 3 inches (76 mm), R-Value 10.8 (h-ft²-degreesF)/Btu (1.9 (m²-degreesC)/W).
 - F. Thickness 3-12 inches (89 mm), R-Value 12.6 (h-ft²-degreesF)/Btu (2.2 (m²-degreesC)/W).
 - G. Thickness 4 inches (102 mm), R-Value 14.4 (h-ft²-degreesF)/Btu (2.5 (m²-degreesC)/W).
 - H. Thickness 4-12 inches (114 mm), R-Value 16.2 (h-ft²-degreesF)/Btu (2.9 (m²-degreesC)/W).
 - I. Thickness 5 inches (127 mm), R-Value 18.0 (h-ft²-degreesF)/Btu (3.2 (m²-degreesC)/W).
 - J. Thickness 5-12 inches (140 mm), R-Value 19.8 (h-ft²-degreesF)/Btu (3.5 (m²-degreesC)/W).
 - K. Thickness 6 inches (152 mm), R-Value 21.6 (h-ft²-degreesF)/Btu (3.8 (m²-degreesC)/W).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has been completed to the point where the insulation may correctly be installed.
- C. Verify that substrate and cavities are dry and free of any foreign material that will impede application.
- D. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Mask and protect adjacent surfaces from overspray or dusting.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Product must be installed according to local code, and must be applied by a qualified applicator.
- B. Apply insulation by spray method, to uniform monolithic density without voids.
- C. Apply to minimum cured thickness as indicated on the Drawings or as scheduled at the end of this Section.
- D. Apply insulation to seal voids at steel joist ends to prevent wind scouring of ceiling insulation.
- E. Do not install spray foam insulation in areas where it will be in contact with equipment or materials with operating temperatures of 180 degrees F (82 degrees C) or greater.
- F. Where building is designed to meet the specific air tightness standards of the Energy Star Program, apply insulation as recommended by manufacturer to provide airtight construction. Apply sealant to joints between structural assemblies as specified in Division 7.
- G. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

- A. Inspection will include verification of insulation and density.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 SCHEDULES

- A. For the following locations, apply the average cured thickness indicated.
 - 1. Interior surface of exterior basement walls: _____ inches.
 - 2. Thermal insulation around main drain: _____ inches.
 - 3. Garage ceiling between joists and over air ducts: _____ inches.
 - 4. Thermal insulation within interior ceilings: _____ inches.
 - 5. Thermal insulation within interior walls: _____ inches.
 - 6. Cathedral ceilings: _____ inches.
 - 7. Unvented roof spaces: _____ inches.
 - 8. Voids in overhangs such as bay windows and cantilevered floors: _____ inches.
 - 9. Exterior above grade walls: _____ inches.
 - 10. Floor headers: _____ inches.

END OF SECTION

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 – GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

- A. Weather barrier membrane
- B. Seam Tape
- C. Flashing
- D. Fasteners

1.2 REFERENCES

- A. ASTM International
 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
 8. ASTM E2178; Test Method for Air Permeance of Building Materials
- B. AATCC – American Association of Textile Chemists and Colorists
 1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
- C. TAPPI
 1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 Submittal Procedures.

- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.
- D. Quality Assurance Submittals
 - 1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 - 2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
 - 3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.
- E. Closeout Submittals
 - 1. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installer shall have experience with installation of weather barrier assemblies under similar conditions.
 - 2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
 - 3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.
- B. Mock-up
 - 1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
 - a. Mock-up size: 10 feet by 10 feet.
 - b. Mock-up Substrate: Match wall assembly construction, including window opening.
 - c. Mock-up may not remain as part of the work.
 - 2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.
- C. Pre-installation Meeting
 - 1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Consultant, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
 - 2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 Product Requirements.
- B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.
- B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.7 WARRANTY

- A. Refer to Section 01 78 36 Warranties.
- B. Special Warranty
 1. Special weather-barrier manufacturer's warranty for weather barrier assembly for a period of ten (10) years from date of final weather barrier installation.
 2. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.
 3. Warranty Areas: [Describe specific areas of work protected and areas of work excluded as required by project conditions].

PART 2 - PRODUCTS

2.1 WEATHER BARRIER

- A. A non-perforated, nonwoven, non-absorbing, breathable membrane that resists air flow, bulk water and wind driven rain and channels water and moisture to the outside of the building envelope. It has microscopic pores that allow moisture vapor to escape from inside walls.
- B. Physical Properties
 1. Spunbonded polyolefin membrane.
- C. Performance Characteristics:
 1. Air Penetration: 0.001 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
 3. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
 4. Basis Weight: Minimum 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
 6. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
 7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.

2.2 ACCESSORIES

- A. Seam Tape: As recommended by the weather barrier manufacturer.
- B. Fasteners:

1. Steel Frame Construction
1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer

2. Wood Frame Construction
Nail Caps: #4 nails with large 1-inch plastic cap fasteners.

3. Masonry Construction
Masonry tap-con fasteners with Caps: 2-inch diameter plastic cap fasteners.

C. Sealants

1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
2. Products: Sealants recommended by the weather barrier manufacturer.

D. Adhesives:

1. Provide adhesive recommended by weather barrier manufacturer.
2. Products: Adhesives recommended by the weather barrier manufacturer.

E. Primers:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Products: Primers recommended by the flashing manufacturer.

F. Flashing

1. Flexible membrane flashing materials for window openings and penetrations recommended by manufacturer.
2. Straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc. recommended by manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Install weather barrier prior to installation of windows and doors.
- C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with

subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier

1. Exterior corners: minimum 12 inches.

2. Seams: minimum 6 inches.

H. Weather Barrier Attachment:

1. Steel or Wood Frame Construction: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

2. Masonry Construction: Attach weather barrier to masonry. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site.

I. Apply flashing to weather barrier membrane prior to installing cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows - all cladding types)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows - all cladding types)

A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of flashing at jambs. Align flashing with interior edge of jamb framing. Start flashing at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's

instructions and ASTM C1193.

- I. Position weather barrier head flap across head flashing. Adhere using flashing over the 45-degree seams.
- J. Tape top of window in accordance with manufacturer recommendations.
- K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

3.6 OPENING PREPARATION (for use with flanged windows)

- A. Cut weather barrier in a modified "I-cut" pattern.
 - 1. Cut weather barrier horizontally along the bottom of the header.
 - 2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.
 - 3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
 - 4. Fold side and bottom weather barrier flaps into window opening and fasten.
- B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

- A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening.
- B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
- C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.
- D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
- E. Install window according to manufacturer's instructions.
- F. Apply strips of flashing at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.
- G. Apply strip of flashing as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.
- H. Position weather barrier head flap across head flashing. Adhere flashing over the 45-degree seams.
- I. Tape head flap in accordance with manufacturer recommendations.
- J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 FIELD QUALITY CONTROL

- A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.9 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 42 13.13 – FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

- A. Flush-profile, concealed fastener metal wall panels, with related metal trim, and accessories.

1.3 RELATED REQUIREMENTS

- A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.
- B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.
- C. Division 07 Section "Air Barriers" for air barriers within wall assembly and adjacent to wall assembly.
- D. Division 07 Section "Metal Soffit Panels" for soffit panels installed with metal wall panels.
- E. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing items in addition to items specified in this Section.
- F. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.4 REFERENCES

- A. ASTM International (ASTM): www.astm.org:

1. ASTM A755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Preprinted by the Coil-Coating Process for Exterior Exposed Building Products.
2. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
3. ASTM C920 - Specification for Elastomeric Joint Sealants.
4. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
5. ASTM D4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
6. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

7. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
8. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

1.5 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer accredited under IAS AC472, Part B.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.
- C. Installer Qualifications: Experienced Installer certified by metal panel manufacturer with minimum of five years experience with successfully completed projects of a similar nature and scope.
 1. Installer's Field Supervisor: Experienced mechanic certified by metal panel manufacturer supervising work on site whenever work is underway.
- D. Steel Construction Publications: Comply with published recommendations in the following, unless more stringent requirements are indicated.
 1. American Institute of Steel Construction (AISC): "Steel Construction Manual."
 2. American Iron and Steel Institute (AISI): "Cold Formed Steel Design Manual."

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency and related trade contractors.
 1. Coordinate building framing in relation to metal panel system.
 2. Coordinate openings and penetrations of metal panel system.
 3. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.7 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products. Include data indicating compliance with performance requirements.
- B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.
 1. Indicate points of supporting structure that must coordinate with metal panel system installation.
 2. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- D. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

1.8 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance of products with requirements.
- B. Qualification Information: For Installer firm and Installer's field supervisor.
- C. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC472 Part B.
- D. Manufacturer's warranty: Unexecuted sample copy of manufacturer's warranty.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.
 - 1. Deliver, unload, store, and erect metal panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - 2. Store in accordance with Manufacturer's written instruction. Provide wood collars for stacking and handling in the field.
 - 3. Shield foam insulated metal panels from direct sunlight until installation.

1.11 WARRANTY

- A. Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within two (2) years from date of Substantial Completion.
- B. Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within the warranty period, as follows:
 - 1. Fluoropolymer Two-Coat System:
 - a. Basis of Design System: MBCI, Signature 300.
 - b. Color fading in excess of 5 Hunter units per ASTM D2244.
 - c. Chalking in excess of No. 8 rating per ASTM D4214.
 - d. Failure of adhesion, peeling, checking, or cracking.
 - e. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURER**

- A. Basis of Design Manufacturer: MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbcicom.
 - 1. Provide basis of design product.

2. Substitutions in accordance with Section 01 25 00.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E1592:
 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - a. Wind Negative Pressure: Certify capacity of metal panels by actual testing of proposed assembly.
 2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/120 of the span with no evidence of failure.
- C. Wall Panel Air Infiltration, ASTM E283:
 1. No air infiltration at static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- D. Wall Panel Water Penetration Static Pressure, ASTM E331: No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).
- E. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

2.3 FORMED METAL WALL PANELS

- A. Flush-Profile, Concealed Fastener Metal Wall Panels: Structural metal panels consisting of formed metal sheet with vertical panel edges and two intermediate stiffening beads, symmetrically placed, with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.
 1. Basis of Design: MBCI, FW-120 Panel.
 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755/A755M.
 - a. Nominal Thickness: 24 gage coated thickness, with stucco embossed surface.
 - 1) Exterior Finish: Fluoropolymer two-coat system.
 - 2) Color: As selected by Architect from manufacturer's standard colors.
 3. Panel Width: 12 inches (305 mm).
 4. Panel Thickness: 1-1/2 inch (38 mm).

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- D. Panel Sealants:
 - 1. VOC Content of Interior Sealants: Sealants used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Architectural Sealants: 250 g/L.
 - 2. Factory-Applied Seam Sealant: Manufacturer's standard hot-melt type.
 - 3. Concealed Joint Sealants: Non-curing butyl, AAMA 809.2.
 - 4. Elastomeric Joint Sealants: Urethane sealant, single-component, ASTM C920 Type S, Grade NS, Class 25, Use NT, A, M, G, O.
 - 5. Foam Tape: Manufacturer's standard self-adhering type.

2.5 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, meeting solar reflectance index requirements.
 - 1. Basis of Design: MBCI, Signature 300.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - 1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal

panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.

B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

A. Concealed-Fastener Formed Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, project drawings, and referenced publications. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer. Fasten panel to support structure through leading flange. Snap-fit back flange of subsequent panel into secured flange of previous panel. Where indicated, fasten panels together through flush-fitted panel sides.

1. Cut panels in field where required using manufacturer's recommended methods.
2. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.

C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.

D. Joint Sealers: Install liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.

1. Seal panel base assembly, openings, panel head joints, and perimeter joints using joint sealers indicated in manufacturer's instructions.
2. Seal perimeter joints between window and door openings and adjacent panels using elastomeric joint sealer.
3. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants".

3.3 ACCESSORY INSTALLATION

A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 CLEANING AND PROTECTION

A. Clean finished surfaces as recommended by metal panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.

PART 2 - PRODUCTS**2.1 JOINT SEALANTS**

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Elastomeric Sealants: Comply with ASTM C 920.
 - 1. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, M, and O, with the additional capability to withstand [50 percent movement in both extension and compression for a total of 100 percent movement] [100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement]. Use for building expansion joints.
 - 2. Single-component, nonsag polysulfide sealant, Type S; Grade NS; Class 12-1/2; Uses NT, M, G, A, and O. For general exterior use.
 - 3. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. For general exterior use.
 - 4. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; and Uses NT, M, A, and O. For general exterior use.
 - 5. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. Use for exterior traffic-bearing joints, where slope precludes use of pourable sealant.
 - 6. Single-component, pourable urethane sealant, Type S; Grade P; Class 25; Uses T, M, G, A, and O. Use for exterior traffic-bearing joints.
 - 7. Single-component, mildew-resistant silicone sealant, Type S; Grade NS; Class 25; Uses NT, G, A, and O; formulated with fungicide. Use for interior sealant joints in ceramic tile, stone, and other hard surfaces in kitchens and toilet rooms and around plumbing fixtures.

- C. Latex Sealant: Single-component, nonsag, mildew-resistant, paintable, acrylic-emulsion sealant complying with ASTM C 834. For interior use only at perimeters of door and window frames.
- D. Acoustical Sealant for Exposed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834. For interior use only at acoustical assemblies.
- E. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound. For interior use only at acoustical assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 1193.
- B. Comply with ASTM C 919 for use of joint sealants in acoustical applications.

END OF SECTION

SECTION 07 95 10 - CAULKING

PART 1 - GENERAL

1.01 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.02 DESCRIPTION:

- A. WORK INCLUDED: Throughout the project, caulk and seal all joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of air and passage of moisture.

1.03 QUALITY ASSURANCE:

- A. Qualifications of Installers:

1. Proper caulking and proper installation of sealants require that installer be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
2. For caulking and installation of sealants throughout the work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this Section.

1.04 SUBMITTALS:

- A. General: Comply with provisions of Section 01 30 00.

- B. Manufacturer's Data: Submit:

1. A complete materials list showing all items proposed to be furnished and installed under this Section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
3. Samples: Accompanying the submittal required in Paragraph "B" submit samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.05 PRODUCT HANDLING:

- A. Delivery and Storage: Deliver all materials of this Section to the jobsite in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the jobsite any material which has exceeded the shelf life

recommended by its manufacturer.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 CAULKING:

A. General: Except as otherwise approved by the Architect, in writing, use only the type of caulking described in this Article.

B. Caulking Materials:

1. Around Fixed Glass "Storefront" Aluminum Frames use silicone based caulking in color matching the aluminum. This caulking furnished and installed by "storefront" aluminum installer.
2. Around Windows: (if any) Use DAP Acrylic Latex Caulk with Silicone, in color to match window color or approved equal.
3. Around Exterior Door Frames: Use DAP Acrylic Latex Caulk with silicone in "Clear" color or approved equal.
4. Miscellaneous Exterior Connections Between Dissimilar Materials: Use DAP Acrylic Latex Caulk with silicone in "Clear" color unless another standard color of the manufacturer would be more suitable.
5. Exterior Masonry Control Joints: Use Dow Corning 790 sealant or approved equal. Prime where required by manufacturer. Provide foam backer rod approved for use by sealant manufacturer.
6. Interior Caulking: Use DAP Acrylic Latex Caulk with silicone or approved equal. Color as selected from manufacturer's standard colors.
7. Caulking Joints Not Otherwise Specified: Use DAP Acrylic Latex Caulk with silicone or approved equal.
8. Top-of-wall sealant for fire rated masonry wall sealant shall be: CP606, CP 672 with respective UL No. recommended by Hilti Company.
9. Fire rated wall penetrations shall be: FS-one intumescent fire stop sealant with respective UL No. recommended by Hilti Company.
10. Smoke and acoustical walls sealant shall be: CP506 Sealant by Hilti.
11. Exterior/Interior of Masonry Walls DowCorning 790 silicone sealant.

C. Prime:

1. In accordance with sealant manufacturer recommendations.

PART 3: EXECUTION:

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until satisfactory conditions have been corrected.

3.02 PREPARATION:

A. All Surfaces:

1. All surfaces in contact with caulking shall be dry, sound, and well brushed and wiped free from dust, and oil or grease.
2. Use solvent, where necessary, to remove oil and grease, wiping the surfaces with clean rags.
3. Remove all mortar from the joint cavity.
4. Where backstop is required, insert the approved backup material in the joint cavity to the depth required.

3.03 INSTALLATION OF SEALANTS:

- A. General: Prior to start of installation in each joint, verify the joint type, and verify that the required proportion of width of joint to depth of joint has been secured.
- B. Equipment: Apply sealant under pressure with hand or power-actuated gun or other appropriate means. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.
- C. Masking: Thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.
- D. Installation of Sealant: Install the sealant in strict accordance with the manufacturer's recommendations thoroughly filling all joints to the recommended depth.
- E. Tooling: Tool all joints to the profile recommended by the caulking manufacturer or as shown by details in the Drawings.
- F. Cleaning Up:
 1. Remove masking tape immediately after joints have been tooled.
 2. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Standard and custom hollow metal doors and frames.
 - 2. Steel sidelight, borrowed lite and transom frames.
 - 3. Louvers installed in hollow metal doors.
 - 4. Light frames and glazing installed in hollow metal doors.
- B. Related Sections:
 - 1. Division 01 Section "General Conditions".
 - 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 3. Division 08 Section "Flush Wood Doors".
 - 4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 5. Division 08 Section "Door Hardware".
 - 6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.

2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.
10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
12. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
13. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
14. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
15. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
16. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
17. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
18. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.
- E. Informational Submittals:

1. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, and TAS 203 standards, and certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, with labeling indicating compliance with the design pressure level and debris impact resistance requirements specified for the Project.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Hurricane Resistant Exterior Openings (State of Texas): Provide exterior hollow metal and door hardware assemblies approved by the Texas Department of Insurance (TDI), including anchorage, capable of withstanding design pressures calculated for this project by a registered architect or engineer and are part of the construction documents per the Texas Department of Insurance, authorities having jurisdiction, and the International Building Code Design Loads Section 1609.
 1. Each unit to bear third party permanent label in accordance with the Texas Department of Insurance requirements applicable to project.
 2. Hurricane-Resistance Test Performance: Provide hollow metal and door hardware approved assemblies that pass large missile-impact tests, as required by Texas Department of Insurance systems location above grade and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
 - a. Impact Resistance: Hollow metal with approved door hardware assemblies must satisfy the Texas Department of Insurance's criteria for protection from windborne debris complying with the International Building Code (IBC). Assemblies must pass the large missile impact test (which equates to Missile Level D or Missile Level E as specified in ASTM E 1996). Assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 18 gauge (0.042-inch -1.0-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - CM Series.
 - b. Curries Company (CU) - M Series.
- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
 4. Hurricane Opening Anchors: Types as tested and required for indicated wall types to meet specified design pressure and impact rating criteria.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
5. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
7. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
8. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
9. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 08 14 16 – FLUSH WOOD DOORS**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors and transom panels with wood-veneer, hardboard or MDF and decorative-laminate faces.
 - 2. Factory finishing wood doors.
 - 3. Factory fitting wood doors to frames and factory machining for hardware.
- B. Related Sections:
 - 1. Division 6 Section "Interior Architectural Woodwork" for requirements for veneers from the same flitches for both wood doors and wood paneling.
 - 2. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
 - 3. Division 8 Section "Glazing" for glass view panels in wood doors.

1.4 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.

3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For decorative-laminate door faces and factory-finished doors.

D. Samples for Verification:

1. As requested by the Architect for verification, provide factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

E. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain wood doors from single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors."
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.

- c. Telegraphing of core construction and delamination of face in decorative laminate-faced doors.
2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- B. Particleboard-Core Doors:
 1. Particleboard: ANSI A208.1.
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 1. Edge Construction: Provide all fire-rated doors edge construction with intumescent seals concealed by outer stile (Category A). Comply with specified requirements for exposed edges.
 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Mineral-Core Doors:
 1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.2 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Graham.
 2. Algoma Hardwoods.
 3. Eggers Industries.
 4. Marshfield Door Systems, Inc.
 5. V-T Industries Inc.
- B. Interior Solid-Core Doors:
 1. Grade: Premium, with Grade A faces.
 2. Species: Select White Birch.
 3. Cut: Rotary Cut.
 4. Match between Veneer Leaves: Book match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.

7. Exposed Vertical Edges: Same species as faces.
8. Core: Particleboard type LD-2, Mineral core.
9. Construction: Five plies. Stiles and rails are bonded to core, and then entire unit abrasive planed before veneering.

2.3 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

1. Blade Type: Vision-proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked-enamel- or powder-coated finish.

B. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked-enamel- or powder-coated finish.

C. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

- B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 41 13 – ALUMINUM STOREFRONT AND WINDOWS

PART 1 - GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

- A. Related Documents: Conditions of the Contract, Division 1 - General Requirements, and Drawings apply to Work of this Section.
- B. Section Includes:
 - 1. Storefront systems, complete with reinforcing, fasteners, anchors and attachment devices.
 - 2. Accessories necessary to complete work.
- C. Related Sections:
 - 1. Section 01 40 00 - Quality Requirements.
 - 2. Section 05 50 00 - Metal Fabrications.
 - 3. Section 06 10 00 - Rough Carpentry.
 - 4. Section 07 92 00 - Joint Sealants.
 - 5. Section 08 81 00 - Glass and Glazing.

1.2 REFERENCES

- A. Aluminum Association (AA):
 - 1. DAF-45 Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
 - 2. 701.2 Specifications for Pile Weatherstripping.
 - 3. Manual #10 Care and Handling of Architectural Aluminum From Shop to Site.
 - 4. SFM-1 Aluminum Storefront and Entrance Manual.
- C. American National Standards Institute (ANSI):
 - 1. A117.1 Safety Standards for the Handicapped.
- D. American Society for Testing and Materials (ASTM):
 - 1. A36 Structural Steel.
 - 2. B209 Aluminum and Aluminum - Alloy Sheet and Plate.

- 3. B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
- 4. B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
- 5. C509 Cellular Elastomeric Pre-formed Gasket and Sealing Material.
- 6. C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
- 7. E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
- 8. E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- 9. E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

E. Federal Specifications (FS):

- 1. TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

F. Steel Structures Painting Council (SSPC):

- 1. Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film).

1.3 SYSTEM REQUIREMENTS

A. Design Requirements:

- 1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
- 2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
- 3. Provide concealed fastening.
- 4. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
- 5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
- 6. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
- 7. Provide for expansion and contraction without detriment to appearance or performance.
- 8. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

B. Performance Requirements:

- 1. Air infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of [0.04 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- 2. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331-93 at a test pressure differential of 12 psf (575 Pa). Water test to be performed immediately after design pressure test.

3. Water Penetration Under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 8.00 lbf/sq. ft. Field water test compliance.
4. Maximum Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

C. Thermal Requirements:

1. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees Fahrenheit (82 degrees Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.

D. Structural Requirements, as measured in accordance with ANSI/ASTM E330:

1. Wind loads for exterior assemblies:
 - a. Basic loading:
 - 1) [] psf acting inward.
 - 2) [] psf acting outward.
 2. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/175 of its clear span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.4 SUBMITTALS

A. General: Submit in accordance with Section 01 33 00.

B. Product Data:

1. Submit manufacturer's descriptive literature and product specifications.
2. Include information for factory finishes, hardware, accessories and other required components.
3. Include color charts for finish indicating manufacturer's standard colors available for selection.

C. Shop Drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems.
2. Include following:
 - a. Fully dimensioned plans and elevations with detail coordination keys.
 - b. Locations of exposed fasteners and joints.
3. Provide detailed drawings of:
 - a. Composite members.
 - b. Joint connections for framing systems.
 - c. Anchorage.
 - d. System reinforcements.
 - e. Expansion and contraction provisions.
 - f. Hardware, including locations, mounting heights, reinforcements and special installation provisions.
 - g. Glazing methods and accessories.

- h. Internal sealant requirements as recommended by sealant manufacturer.
- 4. Schedule of finishes.

D. Samples:

- 1. Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.
- 2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports:

- 1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

F. Certificates:

- 1. Submit manufacturer's certification stating that systems are in compliance with specified requirements.

G. Qualification Data:

- 1. Submit installer qualifications verifying years of experience.
- 2. Include list of projects having similar scope of work identified by name, location, date, reference name and phone number.

H. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility:

- 1. To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.

C. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.

D. Conform to requirements of ANSI A117.1 and local amendments.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 60 00.
- B. Protect finished surfaces as necessary to prevent damage.
- C. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.
- D. Do not leave coating residue on any surfaces.
- E. Replace damaged units.

1.7 WARRANTY

- A. Provide warranties in accordance with the Contract General Conditions.

- B. Provide written manufacturer's warranty, executed by company official, warranting against defects in materials and products for two (2) years from date of Substantial Completion.
- C. Provide written installer's warranty, warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 1 year from date of Substantial Completion.
 - 1. Warranty shall cover following:
 - a. Complete watertight and airtight system installation within specified tolerances.
 - b. Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
 - c. System is structurally sound and free from distortion.
 - d. Glass and glazing gaskets will not break or "pop" from frames due to design wind, expansion or contraction movement.
 - e. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers
 - 1. YKK AP America, Inc.
 - 2. Vista Wall Architectural Products
 - 3. Kawneer
 - 4. Oldcastle Building Envelope
- B. Substitutions: Submit under provisions of Section 01 25 00, a minimum of 10 days prior to bid date.
- C. Acceptable Storefront Framing Systems:
 - 1. Framing System: YES 45 FI (2" x 4-1/2") YKK AP or equivalent by specified manufacturer.

2.2 FRAMING MATERIALS AND ACCESSORIES

- A. Aluminum:
 - 1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.
- B. Internal Reinforcing:
 - 1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
 - 2. Shapes and sizes to suit installation.
 - 3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
- C. Anchorage Devices:
 - 1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
- D. Fasteners:
 - 1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-

- corrosive and compatible with components being fastened.
- 2. Do not use exposed fasteners, except where unavoidable for application of hardware.
- 3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
- 4. For concealed locations, provide manufacturer's standard fasteners.
- 5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
- E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.
- G. Glazing Gaskets:
 - 1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
 - 2. Conform to ASTM C509 or C864.
 - 3. Profile and hardness as required to maintain uniform pressure for watertight seal.
 - 4. Provide in manufacturer's standard black color.
- H. Weatherstripping:
 - 1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
- I. Internal Sealants: Types recommended by sealant manufacturer.
- J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.
- K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

2.3 GLASS AND GLAZING ACCESSORIES

- A. Refer to Section 08 81 00.

2.4 FABRICATION

- A. Coordination of Fabrication:
 - 1. Check actual frame openings required in construction work by accurate field measurements before fabrication.
 - 2. Fabricate units to withstand loads which will be applied when system is in place.
- B. General:
 - 1. Conceal fasteners wherever possible.
 - 2. Reinforce work as necessary for performance requirements and for support to structure.
 - 3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.
 - 4. Comply with Section 08 81 00 for glazing requirements.
- C. Aluminum Framing:
 - 1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
 - 2. Fabricate frame assemblies with joints straight and tight fitting.
 - 3. Reinforce internally with structural members as necessary to support design loads.

4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
5. Seal horizontals and direct moisture accumulation to exterior.
6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
9. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Welding:

1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

E. Flashings:

1. Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.5 FINISH

A. Manufacturer's standard colors as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01 40 00.

B. Verify dimensions, tolerances and method of attachment with other Work.

3.2 INSTALLATION

A. Erection Tolerances:

1. Limit variations from plumb and level:
 - a. 1/8 inch (3 mm) in 10 feet (3 M) vertically.
 - b. 1/8 inch (3 mm) in 20 feet (6 M) horizontally.
2. Limit variations from theoretical locations: 1/4 inch (6 mm) for any member at any location.
3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).

B. Install windows in accordance with manufacturer's printed instructions.

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.

- F. Seal perimeter members as shown on manufacturer's installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer's installation instructions. Use sealants as recommended by sealant manufacturer.
- G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 07 92 00.
- H. Glazing: Refer to requirements of Section 08 81 00. Utilize "anti-walk" edge blocking on all vertical edges of glazing.

3.3 CLEANING

- A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.
- B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION

SECTION 087100 - DOOR HARDWARE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.

C. Related Sections:

1. Division 08 Section "Operations and Maintenance".
2. Division 08 Section "Door Schedule".
3. Division 08 Section "Door Hardware Schedule".
4. Division 08 Section "Hollow Metal Doors and Frames".
5. Division 08 Section "Flush Wood Doors".
6. Division 08 Section "Fire-Rated Steel Framed Entrances".
7. Division 08 Section "Detention Door Hardware".

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
3. ICC/IBC - International Building Code.
4. NFPA 70 - National Electrical Code.
5. NFPA 80 - Fire Doors and Windows.
6. NFPA 101 - Life Safety Code.
7. NFPA 105 - Installation of Smoke Door Assemblies.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, TAS 203 standards, and certified by a qualified independent third party agency acceptable to authority having jurisdiction, with labeling indicating compliance with the design pressure and debris impact resistance level requirements specified for the Project.
 - 2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware 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. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Hurricane Resistant Exterior Openings (State of Texas): Provide exterior hollow metal and door hardware assemblies approved by the Texas Department of Insurance (TDI), including anchorage, capable of withstanding wind load design pressures calculated for this project by a registered architect or engineer and are part of the construction documents per the Texas Department of Insurance, authorities having jurisdiction, and the International Building Code Design Loads Section 1609.
 1. Each unit to bear third party permanent label in accordance with the Texas Department of Insurance requirements applicable to project.
 2. Hurricane Resistance Test Performance: Provide hollow metal and door hardware approved assemblies that pass large missile-impact tests, as required by Texas Department of Insurance systems location above grade and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
 - a. Impact Resistance: Hollow metal with approved door hardware assemblies must satisfy the Texas Department of Insurance's criteria for protection from windborne debris complying with the International Building Code (IBC). Assemblies must pass

the large missile impact test (which equates to Missile Level D or Missile Level E as specified in ASTM E 1996-02). Assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded.

- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of

other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.3 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

- a. Two Hinges: For doors with heights up to 60 inches.
- b. Three Hinges: For doors with heights 61 to 90 inches.
- c. Four Hinges: For doors with heights 91 to 120 inches.
- d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

- a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
- b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

- a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
- b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

- a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

- a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.4 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

2. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
3. Manufacturers:
 - a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 1. Manufacturers:
 - a. Sargent Manufacturing (SA).
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Manufacturer's Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New System: Key locks to a new key system as directed by the Owner.
- E. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- F. Construction Keying: Provide temporary keyed construction cores.
- G. Key Registration List (Bitting List):
 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Heavy duty 12-gauge wrought steel case.
- b. Stainless steel 3/4" one-piece anti-friction reversible latchbolt with a one-piece hardened stainless steel 1" projection deadbolt.
- c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
- d. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
- e. Status indicators inside, outside, or on both sides of doors as specified; available with wording for "locked/unlocked", "vacant/occupied" or custom wording options. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status.
- f. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

- a. Sargent Manufacturing (SA) - 8200 Series.

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Meets ANSI/BHMA A156.41 for single motion egress.
- b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
- c. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.

- d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
- e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
- f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
- g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
- h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
- i. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

- a. Sargent Manufacturing (SA) - 10X Line.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
12. Hurricane and Storm Shelter Compliance: Devices to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or storm shelter products that have been independently third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:
 - a. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - b. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
 - c. Five-year limited warranty for mechanical features.
2. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.

C. Extruded Aluminum Removable Mullions: ANSI/BHMA A156.3 anodized, removable mullions with malleable-iron top and bottom retainers. Mullions to be provided standard with stabilizers and imbedded weatherstrip.

1. Manufacturers:
 - a. Same as exit device manufacturer.

D. Steel Removable Mullions: ANSI/BHMA A156.3 steel removable mullions with options for fire rating, locking, through-wire electrification and hurricane compliance as specified.

1. Provide mullions with functions and features as follows:

- a. At openings designed for severe wind load conditions due to hurricanes or tornadoes, provide manufacturer's certified mullion and accessories to meet applicable state and local windstorm codes.
- b. Provide keyed removable feature where specified in the Hardware Sets.
- c. Provide stabilizers and mounting brackets as required.

2. Manufacturers:

- a. Same as exit device manufacturer.

2.11 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

- a. Sargent Manufacturing (SA) - 281 Series.

C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

- a. Sargent Manufacturing (SA) - 351 Series.

2.12 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door Protective Trim:

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Norton Rixson (RF).

2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko (PE).

2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. SA - SARGENT
3. RO - Rockwood
4. RF - Rixson
5. PE - Pemko
6. OT - Other

Hardware Sets

Set: 1.0

Doors: 120

Description: Ext, PR, Rear Entrance

6 Hinge, Full Mortise, Hvy Wt	T4A3386xNRP 4-1/2" x 4-1/2"	US32D	MK
1 Mullion	HC980	PC	SA
1 Rim Exit Device, Storeroom	HC 64 8804 ETB	US32D	SA
1 Rim Exit Device, Exit Only	HC 8810 EO	US32D	SA
2 Core	As Required	US15	SA
1 Cylinder	980C1	US26D	SA
2 Surface Closer	351 CPS	EN	SA
2 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
2 Astragal	303CPK		PE
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Gasketing Mullion	5110BL 120"		PE
2 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 2.0

Doors: 138

Description: Ext, Small Mech

3 Hinge, Full Mortise, Hvy Wt	T4A3386xNRP 4-1/2" x 4-1/2"	US32D	MK
1 Storeroom Deadbolt Lock	64 8251 LB	US26D	SA
1 Core	As Required	US15	SA

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1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 3.0Doors: [102](#), [102A](#), [131](#), [131A](#)

Description: PR, Soundlock East/West

6 Hinge, Full Mortise, Hvy Wt	T4A3786xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Mullion	L980	PC	SA
2 Rim Exit Device, Classroom	64 8813 ETB	US32D	SA
3 Core	As Required	US15	SA
1 Cylinder	980C1	US26D	SA
2 Surface Closer	351 CPS	EN	SA
2 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
2 Astragal	303CPK		PE
1 Gasketing	S88BL		PE
1 Gasketing Mullion	5110BL 120"		PE

Set: 4.0Doors: [137](#)

Description: Storage

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom/Closet Lock	64 10XG04 LB	US26D	SA
1 Core	As Required	US15	SA
1 Wall Stop	403/441CU	US26D	RO
3 Silencer	608-RKW		RO

Set: 5.0Doors: [136](#)

Description: Mechanical 2

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom/Closet Lock	64 10XG04 LB	US26D	SA
1 Core	As Required	US15	SA

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1	Conc Overhead Stop	6ADJ-x36	689	RF
3	Silencer	608-RKW		RO

Set: 6.0Doors: [116](#), [135](#)

Description: Secure Storage/Electrical

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	64 10XG04 LB	US26D	SA
1	Core	As Required	US15	SA
1	Surface Closer	351 O/P9	EN	SA
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	403/441CU	US26D	RO
3	Silencer	608-RKW		RO

Set: 7.0Doors: [134](#)

Description: Mechanical

3	Hinge, Full Mortise	TA2714xNRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	64 10XG04 LB	US26D	SA
1	Core	As Required	US15	SA
1	Surface Closer	351 CPS	EN	SA
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
3	Silencer	608-RKW		RO

Set: 8.0Doors: [105](#), [128](#)

Description: Judges Quarters

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	64 10XG04 LB	US26D	SA
1	Core	As Required	US15	SA
1	Conc Overhead Stop	6ADJ-x36	689	RF
1	Surface Closer	281 O	EN	SA
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Gasketing	S88BL		PE

Set: 9.0Doors: [104A](#), [129A](#)

Description: Court Reporter/Baliff

3	Hinge, Full Mortise	TA2714xNRP 4-1/2" x 4-1/2"	US26D	MK
1	Entry/Office Lock	64 10XG05 LB	US26D	SA
1	Core	As Required	US15	SA
1	Conc Overhead Stop	6ADJ-x36	689	RF
3	Silencer	608-RKW		RO

Set: 10.0Doors: [104](#), [114](#), [115](#), [121](#), [123](#), [129](#)

Description: Conference/Jury/Office

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Entry/Office Lock	64 10XG05 LB	US26D	SA

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1 Core	As Required	US15	SA
1 Surface Closer	351 O/P9	EN	SA
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	403/441CU	US26D	RO
1 Gasketing	S88BL		PE

Set: 11.0Doors: [133](#), [133A](#)

Description: Meeting Room

3 Hinge, Full Mortise	TA2714xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Entry/Office Lock	64 10XG05 LB	US26D	SA
1 Core	As Required	US15	SA
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Gasketing	S88BL		PE

Set: 12.0Doors: [103A](#), [105A](#), [128A](#), [130A](#)

Description: Judges Quarters/Jury Seating

3 Hinge, Full Mortise	TA2714xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	64 10XG37 LB	US26D	SA
1 Core	As Required	US15	SA
1 Surface Closer	351 O/P9	EN	SA
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	403/441CU	US26D	RO
3 Silencer	608-RKW		RO

Set: 13.0

Doors: 103B, 130B

Description: Jury Seating

2 Hinge, Full Mortise	TA2714xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	64 10XG37 LB	US26D	SA
1 Core	As Required	US15	SA
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
3 Silencer	608-RKW		RO

Set: 14.0Doors: [107](#), [122](#), [126](#)

Description: Private Bathroom

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Lock	10XU65 LB	US26D	SA
1 Surface Closer	351 O/P9	EN	SA
1 Mop Plate	K1050 4" x 1" LDW CSK BEV	US32D	RO

1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	403/441CU	US26D	RO
1 Gasketing	S88BL		PE

Set: 15.0

Doors: 112, 113

Description: Men/Womens Bathroom

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Push Plate	70C-RKW	US26D	RO
1 Pull	RM301	US32D	RO
1 Surface Closer	351 O/P9	EN	SA
1 Mop Plate	K1050 4" x 1" LDW CSK BEV	US32D	RO
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	403/441CU	US26D	RO
1 Gasketing	S88BL		PE

Set: 16.0

Doors: 109A, 124

Description: Overhead Vestibule Door

1 All Hardware	By Others	OT
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Set: 17.0

Doors: 103, 106, 108, 109, 125, 127, 130

Description: Detention Doors

1 All Hardware	By Detention Door Supplier	OT
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Notes: All Hardware complete by detention door supplier

Set: 18.0

Doors: 100

Description: Existing, Ext, PR, Entrance

8 Hinge, Full Mortise, Hvy Wt	T4A3386xNRP 4-1/2" x 4-1/2"	US32D	MK
1 Mullion	HC980	PC	SA
1 Rim Exit Device, Storeroom	HC 16 64 8804 ETB	US32D	SA
1 Rim Exit Device, Dummy	HC 16 8810 ETB	US32D	SA
4 Core	As Required	US15	SA
1 Cylinder	980C1	US26D	SA
2 Surface Closer	351 CPS	EN	SA
2 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
2 Astragal	303CPK		PE
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Gasketing Mullion	5110BL 120"		PE
2 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 19.0

Doors: 120A

Description: Existing, PR, Rear Entrance Vestibule

6 Hinge, Full Mortise, Hvy Wt	T4A3786xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Mullion	L980	PC	SA
2 Rim Exit Device, Passage	8815 ETB	US32D	SA
1 Core	As Required	US15	SA
1 Cylinder	980C1	US26D	SA
2 Surface Closer	351 CPS	EN	SA
2 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
2 Astragal	303CPK		PE
1 Gasketing Mullion	5110BL 120"		PE
2 Silencer	608-RKW		RO

END OF SECTION 087100

SECTION 08 81 00 — GLASS AND GLAZING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Glazing for hollow metal doors and frames.
- B. Glazing for aluminum frames.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Hollow metal doors and frames.
- B. Aluminum entrances and storefronts.
- C. Aluminum window systems.

1.4 SUBMITTALS

- A. Submit manufacturer's literature with material and performance descriptions for each type of glass, sealant and glazing accessories.
- B. Submit detailed shop drawings indicating locations, installation and sealing methods.
- C. Submit 12" x 12" physical samples of each type of tinted or wire glass and panel.
- D. Obtain approved shop drawings from hollow metal supplier, aluminum frame supplier, plastic laminate door supplier.
- E. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to water infiltration, air infiltration, glass failure due to improper sizing or installation, sealant failure.

1.6 QUALITY ASSURANCE

- A. Glazing contractor shall have a minimum of 3 years experience in the installation of glazing products for projects of similar size and scope as this project.
- B. Each piece of glass shall bear manufacturer's label indicating type.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver glass or panels to the jobsite until openings are ready for glazing.
- B. Deliver glass and panels in manufacturer's original protective packaging. Store in a dry, well ventilated area and take care to prevent condensation on the materials. Keep glass faces separated.

1.8 MINIMUM COMPLIANCE STANDARDS

- A. SAFETY: Contractor shall be responsible for meeting all Federal and applicable code requirements for types and locations of glazing regardless of drawing indications. Comply with the current standards of the Consumer Products Safety Commission and Federal Standard 16 CFR 1201 Federal Architectural Glazing Materials Safety Standard.
- B. INSTALLATION: Comply with recommendations of Flat Glass Marketing Association – FGMA Glazing Manual.

PART 2 - PRODUCTS

2.1 GENERAL

- A. GLAZING SHEETS: Glazing materials shall conform to the highest qualities as specified in the following standards:
 1. Float glass: FS DD-G-451d and ASTM C1036.
 2. Float glass, heat strengthened: ASTM C1036 and ASTM C1048.
 3. Float glass, tempered: FS DD-G-1403B and ASTM C1036, ASTM C1048, ANSI Z97.1, and Consumer Product Safety Commission 16 CFR 1201.
 4. Wired glass: FS DD-G-451, ASTM C1036 and ANSI Z97.1. Misco diamond pattern.
 5. Insulating glass: ASTM C1036. Meet industry standards set by the Sealed Insulating Glass Manufacturers Association (SIGMA).
- B. MISCELLANEOUS
 1. Glazing sealants: FS TT-S-1543A (silicone rubber); FS TT-S-230 (synthetic rubber); FS TT-S-001657 (butyl rubber).
 2. Glazing tape: Architectural Aluminum Manufacturer's Association.

2.2 MANUFACTURERS

- A. GLASS:
 - 1. Guardian
 - 2. PPG Industries
 - 3. Pilkington.
- B. TEMPERING, LAMINATING AND HEAT STRENGTHENING:
 - 1. Oldcastle
 - 2. Trulite
- C. WIRE GLASS:
 - 1. Pilkington
 - 2. PPG Industries
- D. GLAZING TAPE:
 - 1. TREMCO – tape, shims, setting blocks, edge blocking.
- E. GLAZING SEALANT:
 - 1. TREMCO,
 - 2. General Electric.

2.3 MATERIALS: Types as indicated in the drawings.

- A. TEMPERED GLASS: 1/4" clear and solar tint float glass tempered by the vertical or horizontal process and meeting requirements of FS DD-G-1403B.
- B. WIRE GLASS: Shall be 1/4" thick. Polish plate glass reinforced with diamond pattern wire mesh No. 24 gauge minimum, with a mesh not larger than 1".
- C. HOLLOW METAL FRAME AND DOOR GLAZING SYSTEM:
 - 1. Glazing: 1/4" Tempered.
 - 2. Glazing tape: 1/8" x 3/8" x continuous preshimmed butyl tape; Tremco 440.
 - 3. Setting blocks: Neoprene or EPDM in minimum 4" lengths.
 - 4. Edge blocking: Neoprene or EPDM in minimum 4" lengths and sized to allow for 1/8" clear expansion at both vertical edges.
 - 5. Add sealant at exterior glazing.

2.4 INSULATING GLASS

- A. Solar Control Tinted Insulated Units
 - 1. Conformance: ASTM C 1172 and complying with testing requirements in CPSC 16CFR-1201 for Category II materials.
 - 2. Overall Thickness: 1 inch (25 mm)
 - 3. Outboard Lite: Bronze float glass.
 - a. Tinted Float Glass: ASTM C 1036, Type I, Class 2, Quality q3.
 - b. Glass Thickness: 1/4 inch (6 mm).
 - c. Heat Treatment: Fully Tempered, ASTM C 1048, Kind FT
 - 4. Interspace: 1/2 inch (12 mm) hermetically sealed air
 - 5. Inboard Lite: Clear float glass.
 - a. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3.
 - b. Glass Thickness: 1/4 inch (6 mm).
 - c. Heat Treatment: Fully Tempered, ASTM C 1048, Kind FT
 - 6. Sealant: Approved by glass manufacturer.

7. Nominal shading coefficient: 0.40

PART 3 - EXECUTION

3.1 INSTALLATION

- A. GENERAL: Install glass without warping, binding or stress. Allow for expansion and contraction of glass due to temperature changes. Do not install sealant with surfaces or ambient temperature below 40 degrees F.
- B. HOLOW METAL FRAMES AND DOORS:
 1. Ensure that finish painting of doors and frames is complete.
 2. Cut glazing tape to length and install against permanent stop, flush with face of stop.
 3. Place setting blocks at 1/4 points.
 4. Rest glass on setting blocks and press against stop for full contact and adhesion at perimeter.
 5. Place continuous glazing tape on opposite-face perimeter of glass in same manner described above. Install removable stop; avoid displacement of tape; and exert pressure on tape for full continuous contact.
 6. Knife trim excess of protruding tape (leave recessed for sealant at exterior glazing).
 7. Do not touch glass to metal.
- C. PLASTIC LAMINATE DOORS:
 1. Follow procedures specified above for non-rated doors. Metal stops provided by door manufacturer.
 2. Follow recommendations of door manufacturer for rated doors. Metal stops provided by door manufacturer.
- D. ALUMINUM FRAMES: Follow door and frame manufacturer's printed instructions for glazing gasketed systems. Provide watertight installation at exterior systems.

3.2 CLEANING AND PROTECTION

- A. During glazing operations, provide sufficient stick-on safety labels or hang streamers on new glazing.
- B. Prior to project closeout, thoroughly clean all glazing inside and out with commercial glass cleaner.
- C. Reglaze any openings where glass is chipped, broken, scratched, pitted or stained.

END OF SECTION

SECTION 09 20 00 — LATH AND PLASTER

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install plaster lathing and accessories, three coat stucco system with floated finish as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Metal studs and gypsum sheathing.
- B. Insulation
- C. Dampproofing and waterproofing.
- D. Painting

1.4 SUBMITTALS

- A. Submit manufacturer's product data describing masonry mix, waterproofing additive, oriental stucco, lath and metal accessories.
- B. Submit mix design.
- C. Submit a 12" x 12" lath and plaster, metal edged sample for each type of plaster and each finish texture for Architect's approval.
- D. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to cracking, water infiltration, loss of adhesion, spalling or discoloration.

1.6 QUALITY ASSURANCE

- A. Plaster contractor shall have a minimum of 3 years experience in the installation of plaster systems for projects of similar size and scope as this project.

PART 2 - PRODUCTS

2.1 LATHING MATERIALS

- A. CHANNELS: 16 gauge, cold rolled pressed steel, galvanized. Flanges minimum 7/16" wide. Minimum weight shall be 475 pounds per 1000 lineal feet for 1-1/2" channels and 300 pounds per 1000 lineal feet for 3/4" channels.
- B. METAL LATH: Copper - alloy steel as follows: 1. Interior dry areas: Flat expanded diamond mesh at ceilings and soffits. Self-furring type at sheathed walls. Galvanized or painted finish. Minimum 3.4 lbs. per square yard. 2. Exterior and interior wet areas: Flat expanded diamond mesh at ceilings and soffits. Self-furring type at sheathed walls. Galvanized finish meeting requirements of FS QQ-Z-325C, Type 1. Minimum 3.4 lbs. per square yard.
- C. WIRE: Annealed galvanized metal wire. Minimum 18 gauge tie wire; minimum 8 gauge hanger wire.
- D. LATHING ACCESSORIES: Galvanized for interior dry areas; solid zinc alloy for exterior work.
 - 1. Casino Beads: MUCor #66 with expanded metal flange, 26 gauge.
 - 2. Corner Beads: U.S.G. NO. 4-R, or approved equal, 26 gauge expansion type.
 - 3. Control Joints: No. 75 per U.S.G.
 - 4. Expansion Joints: No. 40 zinc expansion flange type per Keene.
- E. Wire clips for attachment of furring channels to runner channels shall be formed hairpin clips, 8 gauge galvanized soft steel wire.
- F. METAL STUDS: Provided and installed under another section of these specifications

2.2 PLASTERING MATERIALS

- A. REINFORCING: Alkaline resistant fiberglass strands, 1/2".
- B. PORTLAND CEMENT: ASTM C-150, Type I, white for finish coat.
- C. SAND: ASTM C-144, red torpedo sand for scratch and brown coats.
- D. MASONRY MIX: Pre-mixed dry masonry mortar mix meeting requirements of A.S.T.M. C-91, Type N, as manufactured by Trinity, Ideal, TXI or Lonestar.

- E. FINISH: "Oriental Exterior" stucco as manufactured by United States Gypsum Company, or approved equal. Colors shall match existing stucco colors unless otherwise selected by the Architect. Deliver to job in manufacturer's original packages, with labels intact, seals unbroken. Prepare stucco finish coat for application by mixing with water only.
- F. WATERPROOFING: "Hydrocide" as manufactured by Sonneborn.
- G. WATER: Clean, potable and free from any amounts of mineral and organic substances that would affect set of Plaster.
- H. No asbestos or admixtures.

2.3 MIXES

- A. SCRATCH COAT:
 - 1. 1 sack Portland cement.
 - 2. 2 sacks masonry mix.
 - 3. 9 cu. ft. sharp sand
 - 4. 1-1/2 lbs. fiberglass strands.
- B. BROWN COAT:
 - 1. 1 sack Portland cement.
 - 2. 2 sacks masonry mix.
 - 3. 10 cu. ft. sharp sand.
 - 4. 1-1/2 lbs. fiberglass strands
 - 5. Integral waterproofing per manufacturer's recommendations
- C. Plaster mixes shall comply with ASTM C926.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install furring, lathing, and all plaster work level and plumb, true and rigid. Ensure that all work to be concealed by plaster has been completed and inspected prior to beginning plaster work.
- B. Obtain access panels, frames, or other built-in items from the appropriate trades before beginning plaster work.
- C. Exercise precautions to prevent damage to work of other crafts. Plaster droppings on glass or aluminum surfaces shall be immediately removed with clean water and soft cloths.

3.2 EXTERIOR PLASTER (STUCCO)

- A. All exterior work and interior wet areas to have Portland Cement Finish "Oriental Exterior" sand finish 3/16" to 1/4" thick finished coat, texture to match existing as approved by Architect. Color and texture shall be uniform.

- B. Exterior plaster and interior wet areas to include integral waterproofing, galvanized lath, and pure zinc accessories.

3.3 SUSPENDED CEILING & SOFFIT INSTALLATION

- A. Install suspended ceilings or exterior soffits in indicated locations. Unless otherwise indicated, suspension system shall consist of *1-1/2"* runner channels, *3/4"* furring channels, suspended from structure above by galvanized hanger wires.
- B. Space hanger wire 48" maximum in either direction for interior ceilings. Maximum 36" in either direction for stucco soffits.
- C. Space runner channels 48" on center maximum for interior plaster ceilings, supported from resilient hangers; space 36" on center maximum for plaster soffits
- D. Wrap each hanger wire twice around channels; secure by at least 3 turns around itself. Space furring channels *12-1/2"* on center maximum and at right angles to runners.
- E. Secure to runner channels with wire clips or saddle tied with 2 strands of 16 gauge tie wire giving wire ends 3 twists.
- F. Isolate penetrations (such as light fixtures) with control joints and reinforce with furring channels

3.4 METAL LATH & ACCESSORIES

- A. Apply metal lath to form true surfaces, straight, without sags or buckles, with long dimension at right angles to direction of supports. Secure lath to supports at 6" intervals. Secure side laps on ceilings to supports; tie at 6" intervals between supports. Lap lath at sides at least *1/2"*. Lap lath at ends at least 1", stagger laps; and locate only over supports. Break end joints of lath on alternate sheets of lath. Lath ties shall have a minimum of three complete turns.
- B. Provide corner beads on external plaster corners and where indicated. Corner beads shall be single lengths where length of corner does not exceed standard stock lengths. Miter or cope beads at corners; fasten securely with tie wire spaced 8" maximum; stagger on two wings.
- C. Install casing beads (stops) where plaster abuts other surfaces, at edges of plaster panels, and elsewhere as indicated. Set casing beads level, true to line. Install casing beads in lengths as long as practicable, with joints in straight runs aligned with suitable formed splices. Secure casing beads to metal lath with tie wire spaced 8" maximum.
- D. Provide expansion joints in exterior and interior plaster as shown. Expansion joints shall be in single lengths where possible. Secure expansion joints to metal lath with tie wire; space ties or nail anchors not over 8" apart.
- E. Provide control joints in exterior and interior plaster between expansion joints so that no panel dimension exceeds 12' or 120 square feet of area.

3.5 APPLICATION

- A. Maintain temperature of at least 40 degrees F. in building prior to plaster application, until it is dry. Plaster shall be three coat work on all bases. Plaster thickness from plaster base to finished plaster surface shall be as noted on drawings but shall be a minimum thickness of *3/4"* at its thinnest point. Do not

combine scratch and brown coats. No irregularities shall show in finished surface, such as "cat faces", streaks, waviness, trowel, float or brush marks. Finished surfaces shall be true, uniform in texture and finish.

- B. Apply scratch coat with sufficient pressure to force mortar through mesh and key firmly to lath. Scratch to form rough surfaces. Apply brown coat 48 hours after scratch coat has set; bring out to grounds; straighten to true surface with rod, darby; leave rough, and ready for finish coat.
- C. Apply finish over base coat which has been wetted evenly by brushing or spraying. Apply finish coat not sooner than seven (7) days after brown coat. Provide light sand finish per approved sample.
- D. Keep plaster moist for the curing period between coats. Limit thickness of scratch, and brown coat to maximum 3/8" each.

3.6 PLASTER CUTTING & PATCHING

- A. Execute after other work is in place, and after painter has applied priming coat. Thoroughly rake out, or cut out, moisten and fill with finishing material. Float finish with adjoining work. Point up around fixtures, outlet boxes, switch plates, fittings, piping and other appliances abutting or extending into plastering.

3.7 FINISH PLASTER PROTECTION

- A. Provide protection against damage for finished plaster work. Protect plastering from freezing or premature drying. Execute no plastering work in cold weather, except where work is adequately protected and proper temperatures are maintained to prevent freezing.

END OF SECTION

SECTION 09 21 16 — INTERIOR DRYWALL SYSTEMS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install acoustical batt insulation within interior drywall partitions.
- B. Provide and install all interior drywall systems including light gauge metal studs and tracks, horizontal bridging, gypsum wall board and finishing systems, suspended gypsum board ceilings and soffits, furred gypsum board.
- C. Provide and install troweled firestopping system at drywall ceiling and wall penetrations at rated walls.
- D. Provide and install specified corner guards at each wall corner.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Painting
- B. Door frames
- C. Carpentry (wood blocking)
- D. Plaster on metal studs
- E. Mechanical, electrical and plumbing penetrations in rated drywall systems.

1.4 SUBMITTALS

- A. Submit manufacturer's product data describing all materials.
- B. Submit gypsum board finish schedule indicating level of finish proposed per each area. Finish levels shall be levels 1 through 4 as specified herein and defined by "Recommended Specification: Levels of

Gypsum Board Finish" as jointly published by AWCI, CISA, GA, and PDCA. Submit copy of publication with finish schedule.

- C. Submit manufacturers detail drawings and detailed installation methods for fire rated penetrations and filling of voids with specified firestopping system. Submit only those systems applicable to this project.
- D. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to cracking, joint tape delamination or tearing, dimpling at fastener heads, bowing or warping of wall board, cracking at metal accessories, acoustical sealant failure.

1.6 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered in manufacturer's original packaging and stored flat in a covered, dry area providing protection from damage and exposure to the elements.
- B. Damaged or deteriorated materials shall be removed from the premises.
- C. During cold weather installation of gypsum panels and joint finishing, temperatures within the building shall be maintained within the range of 50 degrees to 80 degrees F. Adequate ventilation shall be provided to carry off excess moisture.
- D. Steel framing and related accessories shall be stored and handled in accordance with AISI's "Code of Standard Practice"

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Drywall Framing:
 - 1. ClarkDietrich Building Systems
- B. Gypsum Board and Related Accessories:
 - 1. United States Gypsum Co.
 - 2. National Gypsum Co.
 - 3. Georgia Pacific
 - 4. James Hardie
- C. Acoustical Batts:
 - 1. Owens-Corning
 - 2. CertainTeed
 - 3. Manville
- D. Acoustical Sealant:
 - 1. TREMCO
 - 2. Ohio Sealants, Inc.
- E. Specialty Trims:
 - 1. Fry Reglet Corp.
 - 2. MM Systems Corp.
- F. Corner Guards:
 - 1. American Specialties, Inc.

2.2 FRAMING: Comply with ASTM C645-09 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645-09 requirements for metal unless otherwise indicated.
2. Protective coating: Comply with ASTM C645-09; roll formed from hot dipped galvanized steel; complying with ASTM A1003/A1003M and ASTM A653/A653M G40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 galvannealed products are not acceptable.

A. METAL STUDS: 25 gauge galvanized roll formed, screw channel type studs with minimum 5/16 inch flanges and 1-1/4 inch legs. Provide widths of 1-5/8 inch, 2-1/2 inch, 3-5/8 inch, 4 inches and 6 inches as indicated in the drawings. Provide conduit punchouts at 24" o.c.

1. "EQ" (Equivalent Gauge Thickness) Steel Studs and Runners: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86-2010 (approved February 2010 Effective March 1, 2010) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C645-09.
2. Non-structural Studs: Cold-formed galvanized steel C-studs, ClarkDietrich Building Systems Pro STUD drywall studs as per ASTM C645-09 for conditions indicated below:
 - a. Flange Size: 1 1/4 inch (32mm)
 - b. Web Depth: As specified on drawings, 1-5/8 inches (41 mm) 2-1/2 inches (64 mm) 3-5/8 inches (92 mm) 4 inches (102 mm) 6 inches (152 mm).
 - c. Member Description: ProSTUD 25 (25ga equivalent drywall stud) 70ksi Minimum Thickness: 0.0150 inches (0.3810mm) Minimum Design Thickness: 0.0158 inches (0.4013mm)
 - d. Member Description: ProSTUD 22 (22ga equivalent drywall stud) 70ksi Minimum Thickness: 0.0179 inches (0.4547mm) Minimum Design Thickness: 0.0188 inches (0.4775mm)
 - e. Member Description: ProSTUD 20 (20ga equivalent drywall stud) 65ksi Minimum Thickness: 0.0220 inches (0.5588mm) Minimum Design Thickness: 0.0232 inches (0.5893mm)

B. RUNNER CHANNELS: Provide 25 gauge galvanized channels with minimum 1-1/4 inch flanges with hemmed edges, in widths to accommodate stud sizes.

1. Non structural Track: Cold-Formed galvanized steel runner tracks, ClarkDietrick Building Systems ProTRAK drywall track in conformance with ASTM C645-09 for conditions indicated below:
 - a. Flange Size: 1 1/4 inch (32mm)
 - b. Web Depth: Track web to match stud web size.
 - c. Minimum Material Thickness: Track thickness to match wall stud thickness or as per design.

C. FURRING CHANNELS: Provide 20 gauge galvanized "hat" channels with face width of 1-1/4 inches, depth of 7/8 inches, and back Width of 2-9/16 inches minimum, hemmed edges.

D. CEILING SUSPENSION: Provide 16 gauge galvanized channels, 3/4" x 1/2" and 11/2" or 2" x 17/32".

1. Firestop tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance rated assembly

indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

- a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; MaxTrak or an equivalent product.

2.3 ACCESSORIES

- A. CORNER BEADS: 26 gauge galvanized beaded angle with 1-1/4" legs.
- B. Channel Bridging and Bracing: Steel, 0.0538-inch (1.37mm) minimum base metal thickness, with minimum 1/2 inch (13mm) wide flanges.
 - a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Spazzer 9200 Bridging and Spacing Bar, or an equivalent product.
 - b. Depth: As indicated on drawings, 7/8 inch by 7/8 inch by 50 inches.
 - c. Install at 48" o.c. horizontally.
2. Backing Plate: Proprietary fire-resistance treated blocking and bracing in width indicated.
 - a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Danback Fire-treated wood backing plate or an equivalent product.
- C. EDGE TRIM: 26 gauge galvanized steel "J" mould and angle with continuous bead. ClarkDietrich Building Systems 200.A and 200.B.
- D. WIRE: 9 gauge galvanized hanger wire and 16 gauge galvanized be wire.
- E. SCREWS: Bugel head Type "S" self tapping drywall screws in lengths recommended by wallboard manufacturer. USG "Super-Tite".
- F. CONTROL JOINTS: Roll formed zinc with 1/4" open joint, and perforated flanges. Provide with fireseal backing at rated systems. ClarkDietrich Building Systems No. 093.
- G. JOINT ADHESIVE: Premixed water based compound. USG taping joint compound.
- H. LAMINATING ADHESIVE: Durabond sheetrock setting-type for double-layer application and column fireproofing.
- I. JOINT REINFORCING: Center creased paper tape equal to "Perf-A-Tape".
- J. TROWELED FIRESTOPPING
 1. System Type: A combination of glass fiber or mineral wool insulation packing material with troweled-on application of sealing compound.
 2. Sealing Compound: Red tinted compound job mixed with water providing protection from heat (to temperatures of 1850 degrees F), smoke, toxic gas, fire and water. "Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop" as manufactured by National Gypsum Co. or approved equivalent by Domtar Gypsum, Inc.
 3. Approvals:
 - a. Rated as noncombustible as defined by NFPA Standard 220 when tested in accordance with ASTM E 136 at Underwriters Laboratories.
 - b. Meet all requirements of ASTM E 814 and UL 1479: Fire tests of through penetration fire stops.
- K. CORNER GUARDS: Stainless steel surface mounted corner guards with beveled edge legs. 3" by 8' lengths, as manufactured by American Specialties, Inc.

2.4 WALLBOARD

- A. TYPICAL: 5/8" thick x 48" wide paper-faced gypsum panels, tapered long edges, lengths as required. U.L. listed and conforming to ASTM C-1396/C1396M-09a Standard Specification for Gypsum Board, Type X. USG fire code.
- B. WATER RESISTANT: 5/8" thick x 48" wide U.L. listed, Type X board with chemically treated face paper and water resistant gypsum core. Comply with ASTM C-1396/C1396M-09a Standard Specification for Gypsum Board.
- C. HIGH IMPACT: 5/8" thick x 48" wide, length as required. U.L. listed, "Fiberock Interior Panel Abuse Resistant" by USG or equal.

2.5 TILE BACKER BOARD

- A. 5/8" thick cement board formed of aggregated Portland cement slurry with polymer-coated, glass-fiber mesh. "Durock" as manufactured by United States Gypsum Co or approved equivalent.

PART 3 - EXECUTION

3.1 PARTITION INSTALLATION

- A. STUD SYSTEM ERECTION: Attach metal runners at floor and to structural elements with suitable fasteners spaced maximum 24" o.c. Position studs vertically, engaging floor track and runner at ceiling or structure. Place studs in direct contact with all door frame jambs, abutting partitions, partition corners and existing construction elements.
- B. Anchor all studs adjacent to door and window frames, partition intersections, and corners to ceiling and floor runner flanges. Securely anchor studs to jamb and head anchor clips of door or side-light frames by screw attachment. Over door and side-light frames, install horizontal runner with a web-flange bend at each end, and secure with one positive attachment per flange.
- C. Install diagonal stud bracing above ceiling at strike side of door jambs and at other locations as indicated in the drawings. Secure to structure.
- D. Follow stud manufacturer's recommendations for all framing construction and fastening.

3.2 WALL PANEL ERECTION

- A. Apply gypsum panels vertically or horizontally. Position all edges over studs for vertical application; all ends over studs for horizontal application. Use maximum practical lengths to eliminate end joints. Fit ends and edges closely together. Stagger joints on opposite side of partition.
- B. For single-layer vertical application of gypsum panels, space screws 12" o.c. in field of panels and 8" o.c. staggered along vertical abutting edges. For horizontal panel application, space screws 12" o.c. in field and along abutting end joints.
- C. For double-layer screw attachment, space screws 16" o.c. for both layers. Apply both layers of gypsum panels vertically with joints in face layer offset from base layer joints. For 5/8" panels, use 1" screws for base layer and 1-5/8" screws for face layers. For 1/2" panels, use 7/8" screws for base layer and 1-5/16" screws for face layer.

3.3 CHASE WALL ERECTION

- A. Align two parallel rows of floor and ceiling runners spaced as indicated in the drawings. Attach to concrete slabs with powder actuated anchors 24" o.c. and to suspended ceiling tees or structure with suitable fasteners 24" o.c.
- B. Position metal studs vertically in runners, 16" o.c., with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor all studs to floor and ceiling runner flanges with U.S.G. Metal Lock Fastener tool.
- C. Cut gypsum panel bracing to be placed between rows of studs, 12" high by chase wall width. Space braces 48" o.c. vertically and attach to stud webs with screw fasteners. 2-1/2" metal studs may be used in lieu of gypsum panels. Anchor web at each end of metal brace to stud web with two 3/8" pan head screws.

3.4 CEILING FRAMING

- A. GRILLAGE ERECTION: Space 8 gauge hanger wires 48" o.c. along carrying channels and within 6" of ends of carrying-channel runs. Wrap hanger around and through beams or joists. Install 1-1/2" carrying channels at 24" o.c. Position channels for proper ceiling height, level and secure with hanger wire saddle-bed along channel. Provide 1" clearance between runners and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to support. Overlap splices at least 8" and securely wire-tie each end with double-strand 16 gauge tie wire.
- B. Erect metal furring channels at right angles to 1-1/2" carrying channels or main support members Space furring (16") o.c. and within 6" of walls. Provide 1" clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double strand 16 gauge tie wire. Overlap splices at least 8" and securely wire-tie each end with double-strand 16 gauge tie wire.
- C. At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.
- D. At rated ceilings meet all requirements of selected U.L. Design No.
- E. METAL STUD CEILING FRAMING OPTION: Attach runners at ceiling height through gypsum panels to each partition stud with two screws. Insert metal studs in runners and attach each end with one 3/8" pan head screw. Install 1-5/8" stud cross-bracing over stud framing, space 48" o.c. and attach to each framing stud with two 3/8" pan head screws. At hangers, install 12" long stud section for box reinforcing or lap studs 12" and secure each end with two 3/8" pan head screws. At light troffers or any openings that interrupt the ceiling, install additional cross reinforcing to maintain structural integrity of framing.
- F. GYPSUM PANEL ERECTION: Apply gypsum panels of maximum practical length with long dimension at right angles to furring channels. Position end joints over channel web and stagger in adjacent rows. Fit ends and edges closely. Fasten panels to channels with 1 ", Type S screws, spaced 8" o.c. in field of panels and 8" along ends and edges.

3.5 EXTERIOR WALLS: Reference Section 05 41 00.

3.6 ACOUSTICAL BATTs

- A. Install unfaced full thickness acoustical fiberglass batts between studs at partitions as scheduled on the drawings. Fit batts tight to studs, tight to floor and head tracks and tight to one another. Batt shall run full height of partition unless indicated otherwise in the drawings.

3.7 ACOUSTICAL SEALANT

- A. Install continuous bead of sealant at bottom tracks at drywall partitions.
- B. Install vinyl foam double stick tape and sealant where head track terminates at ceiling.
- C. See drawings for additional locations.

3.8 ACCESSORY APPLICATION

- A. JOINT SYSTEM: Finish all face panel joints and corners with U.S.G. Joint System installed according to manufacturer's directions.
 1. Mix joint cement in strict accordance with manufacturers directions.
 2. Butter cement into joints filling them evenly and fully.
 3. Center tape and press down into cement leaving sufficient cement under tape for proper bond. Cover with thin coat of cement to fill recess between tape and board to bring material flush with surface.
 4. Face panels shall be cut fit around all wall outlets and switch boxes, utility lines, etc. All voids and cracks, occurring around all openings in board shall be taped and covered with joint cement.
- B. LAMINATING ADHESIVE: Spread to provide 1/2" adhesive beads 4-1/2" o.c. for full sheet lamination. For strip lamination, apply adhesive in vertical strips of four 1/2" beads, 1-1/2" to 2" o.c. Space strips 24" o.c.
- C. CORNER BEAD: Reinforce all vertical and horizontal exterior corners with corner bead fastened with 9/16" rosin-coated staples 9" o.c. on both flanges along entire length of bead.
- D. METAL TRIM: At exposed edges of board or where board terminates against other materials, apply metal trim over panel edge and fasten with screws.
- E. SCREWS: Power-drive at least 3/8" from edges or ends of panel to provide uniform dimple of 1/32" deep.
- F. CONTROL JOINTS: Cut panel at joint and back with double framing members. Attach control joint to face layer with 9/16" rosin-coated staples spaced 6" o.c. on both flanges along entire length of joint. At rated walls, provide fireseal behind joint. Provide joints at 25' maximum or as otherwise indicated in the drawings.
- G. CORNER GUARDS: Install as per manufacturer's recommendations.

3.9 TROWELED FIRESTOPPING:

- A. General: Install systems in complete accordance with manufacturers printed instructions and approved submittal for the required fire rating of the particular condition. Install firestopping systems at all penetrations and voids in all rated drywall ceilings and walls.
- B. Through-penetrations. Ensure that pipe, conduit, duct, cables or other penetration element is rigidly supported by drywall framing on both sides of wall or ceiling assembly. Oversize opening in wall board

to allow for required opening size and thickness of packing material in accordance with system and rating requirements. Install packing material in accordance with system requirements and compressed to allow for required thickness of sealing material. Trowel red-tint sealing material into void (same thickness as gypsum board) and smooth flush with both faces of drywall. Provide additional layer(s) of gypsum board around penetration where necessary to achieve required minimum thickness of sealing material.

- C. Void-filling: For voids such as intersection of walls and smooth or corrugated deck, pack void with compressed packing material and trowel red-tint sealing material into void (same thickness as gypsum board) and smooth flush with both faces of drywall. Provide additional layer(s) of gypsum board around penetration where necessary to achieve required minimum thickness of sealing material.

3.10 WOOD BLOCKING: Coordinate with project carpenter to ensure installation of fire retardant wood blocking between studs for mounting casework, millwork, toilet partitions, drinking fountains and other equipment.

3.11 FINISHING SCHEDULE: Follow published "Recommended Specification: Levels of Gypsum Board Finish" as follows:

- A. LEVEL 1 FINISH: At concealed areas above ceiling.
- B. LEVEL 2 FINISH: At gypsum backing board to be covered with file or panels thicker than 1/4".
- C. LEVEL 3 FINISH: At mechanical rooms, storage rooms, custodial and maintenance rooms, electrical and telephone closets.
- D. LEVEL 4 FINISH: All other drywall areas scheduled for paint, fabric or vinyl wall covering.

END SECTION

SECTION 09 22 00 - PLASTER ACCESSORIES

PART 1 – GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

- A. Related work specified elsewhere includes:
 - 1. Rough carpentry.
 - 2. Finish carpentry and millwork.
 - 3. Metal support systems.
 - 4. Furring and lathing.
 - 5. Plaster.
 - 6. Gypsum board systems.
 - 7. Painting.
 - 8. Wallcovering.

1.2 SUBMITTALS

- A. Product data: Indicate product description, including compliance with specified requirements and installation requirements. Mark manufacturer's brochures to include only those products proposed for use.

1.3 QUALITY ASSURANCE

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. Aluminum Association (AA).
 - 2. American Society for Testing and Materials (ASTM).
- B. Allowable tolerances in horizontal planes:
 - 1. Variation from level: +1/8" in 12'-0".
 - 2. Variation in plane of adjacent wallboard panels prior to joint treatment: 1/16".
- C. Allowable tolerances in framed vertical construction.
 - 1. Position: +1/4" maximum variation from design position.
 - 2. Alignment: 1/8" in 8'-0"; 1/4" maximum in any continuous wall, line or surface.

3. Surface smoothness: No joint or fastener location, roughness or blemish discernible after application of finish when viewed at any angle from a distance of 5'-0" under occupancy lighting conditions, with surface preparation as specified in Painting section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Storage:

1. Stack accessories off floor on pallets or similar platforms providing continuous support for accessories to prevent sagging. Stack accessories so that long lengths are not over short lengths.
2. Do not overload floor systems.
3. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Reject and remove damaged material from site.

1.5 WARRANTY

- A. Finish warranty: Warrant fluoropolymer coating to remain free, under normal atmospheric conditions, from peeling, checking, cracking, chalking in excess of numerical rating of 8 when measured in accord with ASTM D4214-98, of fading in excess of 5 N. B. S. Units during warranty period. Warranty period shall be 5 years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER:

A. Acceptable manufacturer; subject to compliance with specified requirements:

Fry Reglet Corporation.
625 S. Palm Ave.
Alhambra, CA 91803
Phone 800-237-9773 Fax 800-200-4397

- B. Accessory systems of similar design and construction, as manufactured by other manufacturers, may be submitted for Architect's consideration. Acceptance is subject to compliance with specified design criteria, as evidenced by submittal of specified product data. Submittals shall comply with requirements of Product Options and Substitutions section.

2.2 MATERIALS AND FINISH:

A. Anodized finish:

1. Architectural 200R1 medium etch (AA-M32c10A21), clear color.
2. Thickness of anodic coating shall be tested in accord with ASTM B244-97 and sealed to pass modified dye stain test ASTM B136-84(1998).

B. Color anodized finish:

1. Two-step impregnated color Class II Architectural 0.40-0.70 mils (AA-M12C22A33).
2. Thickness of anodic coating shall be tested in accord with ASTM B244-97 and sealed to pass modified dye stain test ASTM B136-84(1998).
3. Color: As selected by Architect from manufacturer's standard color selection.

2.3 REVEALS:

- A. Channel screed:
 1. Acceptable product: Number PCS. DCS.
 2. Characteristics: Screed shall provide reveal and control joint to plaster walls and Ceilings.
 3. Description: Sc
 - b. Material: Extruded aluminum.
 - c. Dimensions: As indicated on drawings.
 - d. Radius: As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- B. 1/4" channel screed:
 1. Acceptable product: Number PCS-75-25/25.
 2. Characteristics:
 3. Description: Screed provides narrow profile control joint.
 - b. Material: Extruded aluminum.
 - c. Dimensions: As indicated on drawings.
 - d. Radius: As indicated on drawings.
- C. "V reveal molding:
 1. Acceptable product: Number PCSV-75.PCSV-75-Short
 2. Characteristics:
 - a. Description: Molding shall create a "V" shaped reveal.
 - b. Material: Extruded aluminum.
 - c. Dimensions: As indicated on drawings.
 - d. Radius: As indicated on drawings.
- D. "F" reveal molding:
 1. Acceptable product: Number FDM. FPM.
 2. Characteristics:
 - a. Description: Reveal molding shall form a trim reveal around doors or between walls and floors.
 - b. Material: Extruded aluminum.
 - c. Dimensions: As indicated on drawings.
 - d. Radius: As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- E. "T" reveal molding:
 1. Acceptable product: Number TRM
 2. Characteristics:

- a. Description: Molding shall provide a reveal at junction of dissimilar materials.
- b. Material: Extruded aluminum.
- c. Dimensions: ____ As indicated on drawings.
- d. Radius: ____ As indicated on drawings.
- e. Ventilation: Provide horizontal vents for air movement.

F. Plaster key reveal molding:

- 1. Acceptable product: Number PRZ.
- 2. Characteristics:
 - a. Description: Molding shall provide termination and reveal at juncture of walls, plaster ceilings and soffits.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ____ As indicated on drawings.
 - d. Radius: ____ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

G. Reveal molding:

- 1. Acceptable product: Number PRM.
- 2. Characteristics:
 - a. Description: Reveal shall provide termination and terminate juncture of walls, plaster ceilings and soffits.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ____ As indicated on drawings.
 - d. Radius: ____ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

H. Contemporary reveal molding

- 1. Acceptable product: Number CDRMCVPR
- 2. Characteristics:
 - a. Description: Contemporary Reveal Molding provides an attractive vertical or horizontal recess in drywall or veneer plaster that creates the illusion the panels are “floating” in space.
 - b. Material: Extruded aluminum
 - c. Dimensions: As indicated on drawings.
 - d. Radius: ____ As indicated on drawings.

2.4 CONTROL JOINTS:

A. 2-piece plaster control screed.

- 1. Acceptable product: Number DCS.PCS
- 2. Characteristics:
 - a. Description: Screed shall provide control joint in interior plaster and exterior stucco.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ____ As indicated on drawings.
 - d. Radius: ____ As indicated on drawings.

2.5 SOFFIT VENTS:

A. Soffit vents:

- 1. Acceptable product: DS.
- 2. Characteristics:

- a. Description: Vent shall act as drip screed and provide ventilation to areas above soffit.
- b. Material: Extruded aluminum.
- c. Dimensions: ___ As indicated on drawings.
- d. Radius: ___ As indicated on drawings.
- e. Ventilation: Provide horizontal vents for air movement.

B. 5/8" soffit vent:

- 1. Acceptable product: Number DS-875-5/8-V-300.
- 2. Characteristics:
 - a. Description: Vent shall function as drip screed and vent for areas above soffit and shall feature a 3/8" long bottom leg to support 5/8" soffit material.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

C. Soffit vent:

- 1. Acceptable product: Number DS-375-V-875.
- 2. Characteristics:
 - a. Description: Vent shall function as drip screed and vent for areas above soffit and shall separate soffit from fascia with reveal and add uniform edge to soffit/fascia joint.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

D. Soffit vent:

- 1. Acceptable product: Number DCS.PCS
- 2. Characteristics:
 - a. Description: Vent shall provide ventilation to areas above soffit, forming a reveal.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

E. Vented soffit molding:

- 1. Acceptable product: Number WPM.
- 2. Characteristics:
 - a. Description: Molding shall provide reveal and venting for soffits and screed point for applying stucco.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

F. Soffit vent E.I.F.S.:

- 1. Acceptable product: Number VFS.
- 2. Characteristics:
 - a. Description: Vent shall provide drip screed and ventilation to areas above soffit.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.

- d. Radius: ___ As indicated on drawings.
- e. Ventilation: Provide horizontal vents for air movement.

2.6 E.I.F.S. MATERIALS:

- A. E.I.F.S. channel screed:
 - 1. Acceptable product: PCS.
 - 2. Characteristics:
 - a. Description: Screed shall act as a 1/4" ground channel screed, control joint, and reveal details on exterior walls and soffits.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- B. E.I.F.S. soffit vent:
 - 1. Acceptable product: Number PCS.
 - 2. Characteristics:
 - a. Description: Vent shall provide ventilation in soffits.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- C. E.I.F.S. Clean Finish soffit vent:
 - 1. Acceptable product: Number SV-75-V-300/EIFS.
 - 2. Characteristics:
 - a. Description: Vent shall be applied after E.I.F.S. application is complete.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- D. Direct application E.I.F.S. soffit vent:
 - 1. Acceptable product: Number DS.
 - 2. Characteristics:
 - a. Description: Vent shall provide drip screed in stucco or synthetic E.I.F.S. finishes.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- E. E.I.F.S. soffit vent (Direct Applied):
 - 1. Acceptable product: Number DRM.
 - 2. Characteristics:
 - a. Description: Vent shall provide vent in direct applied E.I.F.S. substrates in soffits with an E.I.F.S. system.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.
- F. E.I.F.S. soffit vent:

1. Acceptable product: Number VFS.
2. Characteristics:
 - a. Description: Vent shall function as drip screed and provide ventilation to areas above soffit.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

G. E.I.F.S. drip screed:

1. Acceptable product: Number DS.
2. Characteristics:
 - a. Description: Screed shall join soffit and fascia while providing drip joint to prevent water stains on soffit and vertical wall of building.
 - b. Material: Extruded aluminum.
 - c. Dimensions: ___ As indicated on drawings.
 - d. Radius: ___ As indicated on drawings.
 - e. Ventilation: Provide horizontal vents for air movement.

2.7 FASTENERS:

A. Fasteners: Exposed fasteners (provided by installer) shall be countersunk and shall match accessories in color.

1. Aluminum to aluminum: Aluminum or Type 302 or 304 stainless steel.
2. Aluminum to stainless steel or carbon steel: Type 302 or 304 stainless steel.

2.8 FABRICATION:

A. Mounting holes: Provide mounting holes located at 8" o. c.

B. Venting: Vent slots shall be 1" by 1/8" spaced 1-1/2" lengthwise. Each row of vent slots shall provide 1 square inch of free area per lineal foot.

C. Make custom miters and intersections with welded corners or with high-strength industrial tape on backs.

D. Radius shapes shall be as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install plaster accessories in accord with manufacturer's product data and as follows:

1. Corner trim: Install at designated corners.
2. Metal trim shapes: Install at exposed edge of wallboard at door and window openings, at intersections with other materials and at intersection of walls with ceilings.
3. Install corner beads and metal trim shapes to framing system with mechanical anchors spaced at 8" o. c.
4. Joint treatment: Finish joints and attachment flanges as specified in Plaster Stucco section.
5. Dust surfaces and leave ready for decoration. Joint and fastener treatment shall be indistinguishable in finished work.

3.2 PROTECTION

- A. Protect accessories from damage until date of Substantial Completion. Replace accessories which become damaged.

END OF SECTION

SECTION 09 30 00 — WALL AND FLOOR TILE

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install all ceramic wall and floor tile and base as indicated in the drawings and specified herein.
- B. Provide and install all quarry tile flooring and base as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Cast-in-place concrete.
- B. Drywall systems.
- C. Masonry.
- D. Waterproofing and dampproofing.

1.4 SUBMITTALS

- A. Per SUPPLEMENTARY GENERAL CONDITIONS, submit samples, type of tile and color for Architect's approval. Mark with manufacturer's name and space where tile is to be installed.
- B. Submit manufacturer's printed literature describing products.
- C. Submit (2) boxes of tile chips showing full range of available colors.
- D. Submit (2) boxes of grout color samples.
- E. Submit 12" x 12" grouted sample board for each tile/grout combination selected.

F. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to cracking, crazing, staining, joint spalling or cracking, loosening of bond.

1.6 QUALITY ASSURANCE

- A. Tile Contractor shall have a minimum of 3 years experience in tile installation for projects of similar size and scope as this project.
- B. Conform with all applicable requirements of the American Standards Association Specifications (A-108 Series) and the "Tile Handbook" of the Tile Council of America. Tile shall bear the seal of Tile Council of America, Inc., and be equal to or exceed Standard Grade.

1.7 DELIVERY & STORAGE

- A. Deliver all manufactured materials in original, unbroken containers bearing name of manufacturer, brand and grade seal. Keep materials dry, clean and protected against deterioration in any form and at room temperature.
- B. Maintain room temperature between 70 and 80 degrees F. 24 hours prior, during and a minimum of 48 hours after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. CERAMIC TILE:
 - 1. American Olean
 - 2. Dal-Tile
 - 3. United States Ceramic Tile Co.
- B. QUARRY TILE: American Olean, United States Ceramic Tile Co.
- C. GROUT:
 - 1. American Olean
 - 2. Laticrete
 - 3. Tex Rite

2.2 MATERIALS

A. GENERAL:

1. **Floor Tile:** Unglazed porcelain ceramic with cushioned edges and sheet backing.
 - a. **Water absorption:** Classified "Impervious" per A.S.T.M. C-373. Less than 1/2 of 1% absorption.
 - b. **Size:** Nominal 12" x 12" x 1/4" thick.
 - c. **Base:** 4" high base. Bottom tile with integral cove (provide bullnose plastic edge strip at top of all ceramic tile base).
 - d. **Type:** Porcelain Tile in ***groups 3 through 4*** as selected by the Architect from one of the specified manufacturers.
 - e. **Color(s):** Bidders shall assume a different color scheme for each room unless colors and patterns are indicated in the drawings.

B. TOILET/SHOWER ROOMS:

1. **Floor Tile:** Unglazed porcelain ceramic with cushioned edges and sheet backing.
 - a. **Water absorption:** Classified "Impervious" per A.S.T.M. C-373. Less than 1/2 of 1% absorption.
 - b. **Size:** Nominal 1" x 1" x 1/4" thick.
 - c. **Base:** 4" high base. Bottom tile with integral cove.
 - d. **Type:** Porcelain Tile in ***groups 1 through 2*** as selected by the Architect from one of the specified manufacturers.
 - e. **Color(s):** Bidders shall assume a different color scheme for each room unless colors and patterns are indicated in the drawings.
2. **Wall Tile:** Glazed ceramic with cushion edges.
 - a. **Size:** Nominal 4" x 4" x 1/4" thick.
 - b. **Base:** See floor base.
 - c. **Type:** ***Groups 3 through 4*** for field tile and for accent banding as selected by the Architect from one of the specified manufacturers.
 - d. **Color(s):** Bidders shall assume a different color scheme for each room unless colors and patterns are indicated in the drawings.
3. **Trim:** Terminate tile with bullnose edges and rounded outside corners. Provide square inside corners and at ceiling/wall joints.

C. THINSET BOND COAT: Latex/Portland Cement mortar mix meeting requirements of ANSI A118.4. Provide Portland cement and sand in a 1 to 1 mixture gauged with Laticrete 4237 latex additive. Use on dry cured mortar bed at slab recesses, where thinset on concrete slab, and where thinset on wall substrates.

D. SEALANT: One part silicone rubber meeting requirements of FS TT-S-001543, as manufactured by Dow Corning or General Electric.

E. GROUT:

1. **Walls:** Portland Cement waterproof, dry set grout as manufactured by American Olean. Color(s) as selected by Architect.
2. **Floor and base:** Interior grout shall be epoxy type as manufactured by American Olean. Color(s) as selected by Architect.

F. SEALANT: One part silicone rubber meeting requirements of FS TT-S-001543, as manufactured by Dow Corning or General Electric.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Examine surfaces to receive tile and do not start work until defects that will adversely affect tile work have been corrected.
- B. Inspect all surfaces to see that they are dry, clean, free of oily or waxy film, firm, level and plumb. Report any unsatisfactory conditions to the Architect. Starting installation shall be deemed as acceptance of surfaces.
- C. Do not start until work of other trades, which goes through or in the space behind tile has been completed. Do not proceed with installation until adjoining work is satisfactory protected. Close off spaces in which tile is being set to traffic and other work during installation and for at least 48 hours after completion of tile work.
- D. Do not apply mortar and adhesives to surfaces covered by frost. Maintain minimum temperature-for installation of tile above 50 Deg. F. Prevent rapid evaporation of moisture from mortar bed. Do not set tile on dry bed.
- E. Install specified mortar bed at slab depressions. Slope mortar bed uniformly to drain(s).

3.2 INSTALLATION

- A. GENERAL: Tile shall be installed in accordance with current Tile Council of America's "Handbook for Ceramic Tile Installation", design numbers as indicated below.
- B. Center fields and patterns on applied areas so that no tile is less than half size. For heights stated in feet and inches, maintain full courses to nearest attainable height without cutting tile.
- C. Except where otherwise shown or specified, make joints in wall tile vertical and horizontal and joints in floor tile perpendicular and parallel to walls. Control joint widths of glazed tile by lugs on the sides of tile. Control joints widths between sheets of ceramic mosaic tile by supporting boards with metal spacing strips.
- D. Grind and fit tile carefully at intersections, against trim finish and at built-in fixtures and accessories. Fit tile closely around outlets, pipes, fixtures and fittings so that plates, escutcheons and collars will overlap cuts. Cut and drill tile and trim shapes accurately without damage. Rub all exposed cut edges smooth with abrasive stone.
- E. Coat trim with 1/32 to 1/16" pure coat paste. Set in same mortar mix as is recommended for setting flat tile on walls. Do not use pure coat as mortar to set trim and angles.

F. FLOORS:

1. Interior thinset on concrete floor slab:
 - a. Tile bonded with minimum 3/32" thick latex-Portland cement bond coat over cleavage membrane adhered to floor slab (**modified TCA F113**).
 - b. Adhere cleavage membrane to slab in strict accordance with manufacturer's recommendations using specified latex-Portland cement bond coat. Increase typical curing time of bond coat by 50%.
2. Interior thin-set on recessed mortar bed (where required at existing kitchens): Tile bonded with minimum 3/32" thick Latex-Portland Cement bond coat to reinforced mortar bed over loose bond breaker membrane over floor slab (**TCA F111**).

G. WALLS:

1. Ceramic Tile at Drywall Toilets: Thinset to water resistant gypsum wallboard.
2. Ceramic Tile at Drywall Showers: Thinset to tile backer board.
3. Ceramic Tile at Masonry: Bonded to mortar bed at masonry. No. **W211**.
4. 12" x 12" Porcelain – Up to 3 ft. High Wainscot: Install with mastic over drywall.
5. 12" x 12" Porcelain – Over 3 ft. High Wainscot: Thinset over tile backer board.

H. EXPANSION JOINTS:

1. At floor tile provide 1/4" sealant expansion joints in accordance with TCA recommendations where tile abuts walls, curbs, columns and other restraining surfaces, where substrate material changes, at floor slab construction joints (cold joints), and each way in pattern approved by the Owner.
2. At walls install sealant expansion joints at inside corners, at maximum 30', and at other conditions subject to cracking or movement. Install specified sealant at expansion and control joints, at doorframe perimeters and similar conditions.

3.3 LAYOUT

- A. Layout all work so that no tiles less than half size occur. Align all joints vertically and horizontally.
- B. Cut and drill neatly without marring tile. Rub smooth any necessary cuts with a fine stone and set no cut edge against any fixture, cabinet, or other tile without a joint at least 1/16" wide.
- C. Maximum plane variation shall be 1/8" + or – in 10' when a straight edge is laid on the surface in any direction.

3.4 GROUTING AND SEALING:

- A. Follow grout manufacturer's recommendations for grouting procedures and precautions. Damp cure non-epoxy grout in accordance with manufacturer's recommendations.
- B. Grout Haze Removal:
 1. Unglazed Tile: For cement grout remove all grout haze following grout manufacturer's recommendations for use of acid and chemical cleaners. Rinse tilework thoroughly with clean water before and after chemical cleaners. Polish surface of tilework with soft cheesecloth.
 2. Glazed Tile: For cement grout remove all grout haze with cheesecloth rub.
 3. Take special care with epoxy grout to keep tiles clean as work progresses.

3.5 PROTECTION

- A. Protect tiled floors from foot and wheel traffic for at least 7 days after installation.
- B. Place plywood panels over traffic floors.
- C. In non-traffic areas, cover floors with heavy paper taped in place.
- D. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of tile installed.

END OF SECTION

SECTION 09 51 00 - ACOUSTICAL TILE CEILINGS**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install all lay-in acoustical ceiling panels and suspended grid system in accordance with the drawings and as specified herein.
- B. Provide and install light fixture protection at all rated ceilings.
- C. Provide and install hold-down clips where required for rated system.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Steel joists (spacing)
- B. Mechanical (air devices)
- C. Electrical (lighting fixtures)

1.4 DRAWING REFERENCES

- A. See drawings, finish schedule and Section 2.2 for ceiling types and ratings.

1.5 SUBMITTALS

- A. Submit manufacturer's product data describing all materials, finishes, ratings and installation requirements.
- B. Submit physical samples for each type of acoustical tile proposed.
- C. Submit physical samples for each type of grid proposed.
- D. Submit tile manufacturer's certification for whether hold-down clips are required for the selected tile(s) and rated system(s).
- E. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.6 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to rusting or deflection of grid, deterioration or deflection of acoustical tiles.

1.7 QUALITY ASSURANCE

- A. Suspended acoustical ceiling contractor shall have a minimum of 3 years experience in the installation of specified systems for projects of similar size and scope of this project.
- B. Installation of acoustical tile and panels shall not begin until residual moisture from plaster, drywall, concrete or terrazzo work is dissipated. Before installation, the building shall be enclosed and permanent heating and cooling equipment in operation.

1.8 DELIVERY AND STORAGE OF MATERIALS

- A. Do not deliver materials to jobsite until spaces are ready for ceiling installation.
- B. All materials shall be delivered in manufacturer's original packaging and stored in an enclosed shelter providing protection from damage and exposure to the elements.
- C. Damaged, rusted or deteriorated materials shall be removed from the premises.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. TYPICAL CEILING PANELS:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Interiors, Inc.
- B. SPECIALTY CEILING PANELS
 - 1. Acoustical Resources, Inc.
 - 2. Wenger
 - 3. U.S.G.
- C. GRID SYSTEMS:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Interiors, Inc.
 - 3. Chicago Metallic Corp.

2.2 MATERIALS:

- A. TYPICAL CEILING PANELS:
 - 1. 24" x 24" x 5/8" white **"Cortega Square Lay-in" No. 770**, square-edged as manufactured by Armstrong or equivalent (color, pattern, texture) by specified manufacturer. **Non-rated system.**

2. 24" x 24" x 5/8" white **"Cortega Square Lay-In" No. 824** square-edged as manufactured by Armstrong or equivalent (color, pattern, texture) by specified manufacturer. **Fire-rated system.**

B. SUSPENSION SYSTEM:

1. Components shall be formed from commercial quality cold-rolled steel, electro-galvanized, 2'x2' module.
2. The suspension system shall support the ceiling assembly with a maximum deflection of 1/360 of the span per A.S.T.M. C-635-69.
3. Main tee with double web design 1-1/2" high and rectangular bulb; 15/16" exposed flange with rolled cap; cross tee holes at 6" o.c.
4. Four foot cross tee 1-1/2" high with double web design. Rectangular bulb joining main runners at 2' on center.
5. Two foot cross tees perpendicular to 4' cross tees. Two foot cross tees minimum of 1-1/2" high, No. CMC 222-41 or equivalent by specified manufacturer.
6. Wall molding - hemmed edge, electro-galvanized cold rolled steel with equal leg width, finish to match grid.
7. Finish: Typical finish, factory white painted steel. At high humidity areas including kitchens, dressing rooms, toilet rooms provide factory white painted aluminum cap.
8. Rating: Provide U.L. listed grid for scheduled system rating.

PART 3 – EXECUTION

3.1 COORDINATION

- A. Verify that above ceiling work, including fire dampers, ductwork, piping, wiring and insulation is complete and approved prior to beginning ceiling work.

3.2 INSTALLATION

- A. Ceiling systems shall be suspended from structural members by 12 gauge annealed wire; spacing as recommended by manufacturer. Provide additional support for light fixtures and grilles at each corner. Provide secondary support framing ("Unistrut") where spacing of structural members exceeds suspension system manufacturer's recommendations.
- B. Acoustical lay-in panels shall be installed in strict accordance with the manufacturer's instructions. Tile shall be installed with fissures or pattern all in same direction.
- C. Provide additional hangers at ceiling suspended items including projection screens, speakers, exit lights, air supply and return grilles.
- D. Space main runner hangers a maximum of 6 inches from wall. Do not support systems from wall.
- E. Adjust hangers to ensure level ceiling in plane.

3.3 RATED CEILINGS

- A. Provide specified ceilings in fire rated assembly. Protect light fixture protection in accordance with approved U.L. Design to meet required assembly rating. Provide additional hangers to meet the requirements of the particular U.L. rating.
- B. Ceiling system manufacturers not listed in the required U.L. design number (reference drawings) shall be responsible for determining whether their rated system is acceptable to the particular local code authority.
- C. For ceiling tiles weighing 1 lb. per square foot or more, verify no requirement for hold-down clips at rated systems.

3.4 CLEANING AND REPLACEMENT

- A. At completion, replace file unit and grid systems that are damaged. Clean or replace tile and grid systems that cannot be cleaned.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of ceiling tile installed.

END OF SECTION

SECTION 09 65 00 – RESILIENT FLOORING AND BASE**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install all vinyl tile flooring as indicated in the drawings and specified herein.
- B. Provide and install all resilient base as scheduled throughout the project, regardless of floor finish.
- C. Provide and install all resilient transition strips at resilient flooring, steps, stairs and change of flooring materials.
- D. Install tapered resilient transition edge strip at any place where resilient floor is installed on concrete steps/stairs and terminates with risers.
- E. Provide five (5) coats of wax on all new resilient flooring.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Cast in place concrete.
- B. Millwork.

1.4 SUBMITTALS

- A. Submit manufacturer's product data describing all materials.
- B. Submit physical samples of all resilient materials to the Architect for approval. Color(s) to be selected by the Architect.
- C. Submit manufacturer's recommendations for finishing and maintenance of resilient flooring materials.
- D. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to loss of adhesion, excessive surface wear, color change, curling or other deterioration.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver flooring materials to the jobsite until spaces are ready for installation of resilient flooring.
- B. Open material packages and acclimate flooring materials within the installation spaces for a minimum of 3 days prior to installation.

2 PART TWO – PRODUCTS

2.1 MANUFACTURERS

- A. VINYL TILE:
 1. Armstrong World Industries
 2. Azrock Industries, Inc.
 3. Johnsonite
 4. Tarkett
- B. RESILIENT BASE:
 1. Roppe
 2. Burke Flooring Products
 3. Mercer Products Co., Inc.

2.2 MATERIALS

- A. VINYL TILE: 12" x 12" x 1/8" Standard Excelon "Imperial Texture" vinyl composition tile, as manufactured by Armstrong World Industries, or equivalent in color and design by specified manufacturer.
- B. RESILIENT BASE: 4" high x 1/8" thick x 4' lengths, rubber cove base as manufactured by Roppe or equivalent by specified manufacturer. Color(s) to be selected by the Architect. Provide manufacturer's pre-molded outside corners.
- C. TRANSITION STRIPS: Vinyl transition strips as manufactured by Roppe or equivalent by specified manufacturer. Color(s) to be selected by the Architect.

3 PART THREE – EXECUTION

3.1 PREPARATION

- A. Inspect the completed floor slab for defects which may adversely affect the finished resilient tile work. Commencing resilient flooring operations indicates acceptance of the sub-floor.
- B. Subfloor depressions shall be brought to level with latex underlayment. Raised areas shall ground and smoothed prior to resilient flooring installation.
- C. Thoroughly clean subfloor of all wax, oil, dusting, dirt or other deleterious material.

3.2 INSTALLATION

A. VINYL COMPOSITION TILE

1. Tile shall be installed in strict accordance with the manufacturer's recommendations using adhesive approved by tile manufacturer.
2. Unless otherwise indicated in the drawings, lay flooring with joints and seams aligned with building walls. Start laying tiles from the center of the room out for equal sized tiles at the perimeters. Avoid tiles of less than $\frac{1}{2}$ size.
3. Spread adhesive using notched trowel. Apply only enough adhesive at one time to allow placing of tile prior to initial setting of adhesive.
4. Use heavy roller to smooth tile and ensure complete adhesion.
5. Install tapered resilient edge strip at any place where resilient floor meets concrete, carpet or other finish flooring material. Typically material changes should be made at the centerlines of doors. Color(s) as selected by the Architect.
6. Install tapered resilient transition edge strip at any place where resilient/wood flooring is installed on concrete steps/stairs and terminates with risers. Ensure a tight fit so resilient floor will not crack or be damaged by foot traffic. Color(s) and size as selected by the Architect.
7. Install tapered resilient transition edge strip at any place where there is a change of height and/or flooring materials.
8. A feature strip shall be used to divide any two areas where it is not possible to maintain alignment from one area to the adjoining area. Coordinate with Architect.
9. Scribe flooring to walls, columns, cabinets, floor outlets and other interruptions to ensure tight fitted joints.

B. RESILIENT BASE:

1. Install base using manufacturer's recommended adhesive applied with notched trowel. Install with contact cement within 6" of a job-formed outside corner.
2. Miter inside corners. Use factory-formed outside corners unless job-formed corners are specifically approved by the Architect.
3. Butt joints tight and scribe base to door frames, columns and other interruptions.

C. TRANSITION STRIP:

1. Subfloor must be smooth, sound, dry, clean, and free of dirt, wax, polish, paint, and all other foreign matter which may interfere in a good bond, including curing agents and sealers.
2. Carefully follow warnings on container of the Solvent-Based Contact Adhesive. Follow adhesive manufacturer's recommendations for the installation of TRANSITION STRIPS.

3. Roll TRANSITION STRIP with a hand roller.

3.3 CLEANING AND ADJUSTING

- A. After installation all resilient flooring shall be cleaned and contractor shall provide five (5) coats of wax on all new resilient flooring.
- B. Replace any damaged tile or tile that shows inconsistent shades of color/pattern. Remove glue stains or other marks.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of resilient flooring installed.

END OF SECTION

SECTION 09 68 00 – CARPET

PART 1 – GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUMMARY

- A. Section Includes:
 - 1. Carpet (broadloom).
 - 2. 24x24 Carpet Tiles.
 - 3. Accessories.
- B. Related Documents: The Contract Documents, as defined in Section 01 11 00 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.
- C. Related Sections:
 - 1. Section 09 65 00 - Resilient Flooring: Tile and base.
 - 2. Section 14 20 00 - Elevator: Elevator Cab floor finish.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 684 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. BOCA:
 - 1. FF-1-70.
- C. Carpet and Rug Institute (CRI):
 - 1. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials.
 - 2. Green label certification.
- D. HUD:
 - 1. UM44d Standards.
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 253 - Test for Critical Radiant Flux of Floor Covering Systems.
 - 2. NFPA 258 - Standard Research Test Method for Determining Smoke Generation of Solid Materials.

1.4 SYSTEM DESCRIPTION

- A. Recycled content: minimum 50% total recycled content, with not less than 10% post consumer recycled materials and the balance post-industrial recycled materials.
- B. Materials: all materials shall be high quality and of the type generally accepted for use in the industry. When used as intended, the materials shall be non-toxic, non-allergenic and free of similar health hazards. These materials include, but are not limited to, adhesives, cleaners, solvents, etc.
- C. Recyclability: The carpet must be 100% recyclable.
- D. Carpet shall inhibit the growth of fungi, gram-positive and gram-negative bacteria, in accordance with AATCC 138 or AATCC 174, parts 2 and 3. (Provide 3000 ppm of zinc OMADINE® bactericidefungicide.)

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Procedures for submittals.
 - 1. Product Data: Data on specified products, describing physical characteristics and method of installation.
 - 2. Shop Drawings: Indicate seaming plan, method of joining seams, and direction of carpet.
 - 3. Samples: Submit two samples 13-1/2 inch x 18 inch in size illustrating color and texture.
- B. Procedures for Closeout Submittals:
 - 1. Include the following certifications:
 - a. Stain proof certificate.
 - b. No zippering certificate.
 - c. Carpet and Rug Institute green label certification.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing work of this Section with minimum 5 years documented experience.
- B. Regulatory Requirements:
 - 1. NFPA 253 Critical Radiant Flux in Accordance with ASTM E 684: Class 1.
 - 2. NFPA 258 NBS Smoke Chamber: Less than 450 flaming mode.
 - 3. BCA flame spread classification: DOC FF-1(use group R-2 sprinklered).
 - 3. HUD: UM44d Standards.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Adhesives: No adhesives to be used.
- B. CRI "green label".

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Transport, handle, store, and protect products.
- B. Deliver carpet in original mill wrappings with register number marked on each bale.

- C. Storage areas shall be secure and dry with temperatures maintained above 65 degrees F at all times.
- D. Remove carpet from its packaging and allow to acclimatize to area of installation 24 hours before application.

1.9 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Environmental Requirements: Do not install carpet unless a constant temperature of at least 65 degrees F. is maintained for 72 hours before, during and 48 hours after application in all areas to receive carpeting.

1.10 WARRANTY

- A. Carpet Manufacturer's Warranty:

Submit a written Warranty, signed by carpet manufacturer and carpet installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship, including but not limited to the following:

- A. Delamination.
- B. Edge ravel.
- C. Wear.
- D. Tuft bind.

- 2. Warranty Period: 10 years.

1.11 MAINTENANCE

- A. Maintenance Data: Maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with Project requirements, manufacturers offering Products which may be incorporated in the Work include the following:

CARPET TILES AND CARPET:

1. Mannington Commercial, Calhoun, GA. (800) 241-2262
2. Interface, LaGrange, GA. 800-336-0225
3. Mohawk Group, Marietta, GA. (800) 554-6637
4. Substitutions: Refer to Section 01600 – Substitution Procedures.

2.2 CARPET ACCESSORIES

- A. Subfloor Filler: Latex underlayment, mixed with undiluted latex liquid furnished by the selected manufacturer. Use one of the following products.

1. Levelayer I, by Dayton Superior Corporation, Miamisburg, OH (800) 745-3700.

2. No. 345, by W.W. Henry Company, Orange, CA (800) 447-0216.
3. Approved Substitutions: Refer to Section 01 25 00 – Products and Substitutions.

B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

C. Base Gripper: Tackless strip type with special lipped edge; color to match carpet.

D. Seam Adhesive: Recommended by manufacturer.

E. Rubber Transition and termination strips: Equal to Johnsonite Specialty Flooring Accessories, color to be selected by Architect

F. Adhesives: Materials must comply with the toxicity and emission limits specified in Article 1.3 above.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution Requirements: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Prepare substrate for product installation in accordance with manufacturer's published instructions.
- B. Subfloor ridges, bumps, and other irregularities. Fill cracks, contraction joints, holes, and depressions with subfloor filler as recommended by manufacturer to achieve smooth, flat hard surface.
- C. Where carpet is installed on existing wood floors, carpet shall be installed directly on existing floors without underlayment.
- D. If carpet is installed on concrete floors, apply subfloor filler and leveler to provide finished concrete surface smooth, with no more than 1/8 inch variation from plane within 10 feet in any direction. Prohibit traffic until subfloor filler is cured.
- E. Remove old adhesive, paint, oils, waxes, sealers and curing compounds not compatible with adhesive to be used. Avoid organic solvents.
- F. Vacuum clean substrate.

3.3 INSTALLATION

- A. General Installation:

1. Install carpet and cushion in accordance with manufacturers instruction and CRI 104.
2. Verify carpet match before cutting to ensure minimal variation between dye lots.
3. Lay out carpet.
 - A. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - B. Do not locate seams perpendicular through door openings.
 - C. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - D. Locate change of color or pattern between rooms under door centerline.
 - E. Provide monolithic color, pattern, and texture match within any one area.
 - F. Extend carpet under removable flanges and furnishings and into alcoves and closets of each space.
 - G. Provide cut outs where required and bind cut edges where not concealed by protective edge guards or overlapping flanges.
 - H. Install with pattern parallel to walls and borders.
4. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance. Use power stretcher where carpet is greater in length than 20 feet.
5. Install carpet edge guard where edge of carpet is exposed and anchor guards.
6. Install carpet by trimming edges, butting cuts with seaming cement, and taping and/or sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet.
7. Trim edges and butt cuts with seam cement.
8. Carpet shall be installed directly on floor slab or wood floor with reusable hook/loop tape method using 3M TacFast or approved equal. Double sided tape is not acceptable.

B. Installation on Interior Steel Stairs:

1. Install tackless strips at back of treads, with pins facing riser, and at bottom of riser, with pins facing tread.
2. Install cushion on stair treads and lap over nosing.
3. Install carpet on stairs with the run of the pile in opposite direction of anticipated traffic to avoid peaking of backing at nosings.
4. Stretch carpet over stair treads, full width in one piece as indicated on plans. Fold carpet under 1 1/2 inches (4 cm) on each side.

3.4 FIELD QUALITY CONTROL

A. Section 01 45 00 - Quality Control: Field inspection.

B. Inspect carpet and base installation, seaming, pattern, layout, and attachment to substrate.

3.5 CLEANING AND PROTECTION

A. Comply with CRI 104, Section 15 - Protection of Indoor Installation, and manufacturer's recommended

cleaning procedures and as follows.

- B. Section 01 70 00 - Execution Requirements: Cleaning and protection of installed work.
- C. Vacuum carpet using commercial machine with face-beater element. Remove spots, according to manufacturer's recommendations, and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors. Final cleaning with HEPA vacuum as required by Section 01 35 00.
- D. Remove and recycle excess material as required by the Construction Waste Management Program, Section 01 56 50.

3.6 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:

- 1. Temporary ventilation: As specified in Section 01 15 00 - Environmental Procedures.

- A. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of minimum 60 degrees F to maximum 90 degree F continuously for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Owner and Architect.

3.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of carpet installed.

END OF SECTION

SECTION 09 91 00 – PAINTING AND FINISHING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide all labor, materials, and equipment required for all painting, staining and finishing as indicated in the drawings, the approved submittals, and as specified herein. Painted or stained systems include but are not necessarily limited to the items listed below:
- B. EXTERIOR SYSTEMS:
 - 1. All visible wood unless noted otherwise.
 - 2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes.
 - 3. Exposed conduit, piping, etc., except for roof mounted piping not visible.
 - 4. Exposed roof mounted equipment visible from ground level or from upper floors of the building.
 - 5. All exposed concrete masonry units.
 - 6. All items normally painted in accordance with good construction practice.
- C. INTERIOR SYSTEMS:
 - 1. All visible wood or behind cabinet doors unless noted otherwise.
 - 2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes. Structural steel, steel joists and deck exposed to view except in mechanical rooms.
 - 3. Exposed conduit, piping, outlet boxes, raceways, and panel boxes except galvanized or aluminum piping located in mechanical or electrical rooms.
 - 4. All exposed concrete masonry units, gypsum board and plaster unless otherwise noted.
 - 5. All factory-primed hardware. Back-priming of all wood trim, millwork or finished carpentry prior to installation.
 - 6. All hollow metal doors and frames.
 - 7. All items normally painted in accordance with good construction practice.
 - 8. All unfinished louvers and grilles.

1.3 WORK TYPICALLY EXCLUDED

- A. Shop applied primer on structural steel and miscellaneous metals items.
- B. Aluminum frames, doors, and windows.
- C. Plastic clad casework, millwork, and wall panels.
- D. Factory finished equipment unless noted otherwise (provide job touch-up).

1.4 DRAWING REFERENCE: Reference any paint or finish notes in the drawings for any pre-selected colors or other requirements.

1.5 SUBMITTALS

- A. Submit manufacturer's product data describing each proposed type of paint, sealer, stain, or coating and its recommended use. Include viscosity and percent solids information. Where not the specified base manufacturer, list the specified brand name and type and the proposed substitute. The Architect shall be the sole judge as to equivalency of systems.
- B. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.6 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of two years after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to peeling, crazing, cracking, blistering, mildewing, chalking or dusting, pin holes, color fade or loss of hardness or sheen.

1.7 QUALITY ASSURANCE

- A. Painting contractor shall have a minimum of 5 years experience in the application of the specified systems for projects of similar size and scope as this project.
- B. If requested by the Architect, provide system manufacturer's certification of the proposed painting contractor as approved for application of the product.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver painting materials to the jobsite until spaces and surfaces are ready for painting.
- B. Deliver materials in manufacturer's original containers, unopened except for shop mixing of colors. Containers shall bear manufacturer's readable labels indicating brand and type of paint. Any additional containers with labels indicating products not approved shall be removed from the jobsite. Any applied material not previously approved by the Architect is subject to removal and reapplication with the appropriate approved product.
- C. Store materials in environmentally controlled area. Interior products shall be acclimated to a temperature range of 50-80 degrees F. at least 24 hours prior to application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. TYPICAL PAINTS: Systems are based on the first listed manufacturer. Only equivalent systems provided by specified manufacturers in accordance with attached Product Comparison sheet and as approved by the Architect are approved for use.

1. Sherwin Williams, Inc.
2. Pittsburgh Paints
3. Pratt & Lambert
4. Benjamin Moore Co.

B. SPECIALTY PAINTS:

1. Epoxies: Sherwin Williams, PPG, Pratt & Lambert.

C. SUBSTITUTIONS: In accordance with Section 01 25 00 Substitution Procedures.

2.2 INTERIOR SYSTEMS

A. SYSTEM TYPES FOR NEW WALLS (Unless indicated otherwise on Finish Schedule or drawings):

1. Drywall in toilet rooms, storage rooms, and mechanical/electrical/toilet rooms/ classrooms: **Semi Gloss Enamel** at walls and ceilings.
2. Drywall soffits: **Eggshell Enamel**.
3. Typical masonry (CMU): **Gloss Enamel**.
4. Masonry (CMU) in toilet rooms: **Gloss Epoxy**.
5. Steel railings: **Gloss Aliphatic Urethane**.
6. Suspended rigging over stage: **Dry Fog**.

B. SYSTEM DESCRIPTIONS (Reference item 3.3 for modifications and preparation required for these systems when applied to existing walls already painted):

1. Primer on gypsum board: SW PrepRite High Build Primer B28W601 – one coat over light to medium texture (submit texture sample for approval)
2. Eggshell Enamel on Drywall: SW Pro Mar 400 Latex Eg-Shel B20W4400 – one coat over specified primer.
3. Semi-Gloss Enamel on Drywall: SW Pro Mar 400 Latex Semi Gloss B31W4400 - one coat over specified primer.
4. Epoxy Paint on Drywall: One coat SW PrepRite 200 Latex Primer B28W200 over specified primer.
5. Gloss Enamel on Drywall: Two coats SW Water Based Catalyzed Epoxy B70 Series gloss acrylic over specified primer.
6. Semi-Gloss Enamel on shop-primed metals: SW Water Based Industrial Enamel B53-300 acrylic gloss Enamel – two coats.
7. Natural Finish on Wood: SW Sherwood BAC Wiping Stain (one coat) + SW Wood Classics Sanding Sealer B26V3 (one coat) + SW Wood Classics Satin Varnish A66.
8. Clear Finish on Wood: SW Wood Classics Polyurethane Varnish A67 (two coats). Sand lightly between all coats.
9. Block Filler: SW Prep Rite Block Filler B25W25 (for areas not subject to moisture); SW Heavy Duty Block Filler (for areas subject to moisture). Provide 2 coats as specified under “Execution”.

10. Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water based Industrial Enamel gloss acrylic latex over specified primer.
11. Semi-Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water Based Industrial Enamel semi-gloss acrylic latex over specified primer.
12. Semi-Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy semi-gloss over cured concrete plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
13. Gloss Epoxy Paint on CMU: Two coats block filler (unless surface-bonded) plus finish coat of gloss. Minimum paint thickness 3.0 dry mils.
14. Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy gloss over cured concrete plus finish coat of SW Water Based Epoxy gloss. Minimum paint thickness 3.0 dry mils.
15. Semi-Gloss Enamel on utility piping and galvanized metals: SW Pro-Cryl Universal Metal Primer – one coat + SW DTM Acrylic Semi Gloss – two coats.
16. Semi-Gloss Epoxy Paint on CMU: Two coats block filler plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
17. Gloss Aliphatic Urethane Enamel on primed steel railings: Over epoxy shop primer apply two coats SW Hydrogloss Single Component Water Based Urethane B65-181 Urethane Gloss Enamel using airless spray equipment.
18. Dry Fall Acrylic (exposed deck, structure and rigging): One coat SW Super Save Lite Acrylic Dry Fall Eggshell Primer & Finish. Black color. Overspray dries to non-adhering dust in a ten foot fall.

2.3 EXTERIOR SYSTEMS

A. SYSTEM TYPES:

1. Exterior Metals: **Gloss Enamel**.
2. Field welds: **Zinc-Rich Coating**.

B. SYSTEM DESCRIPTION:

1. Gloss Enamel on Galvanized Metals: SW Pro-Cryl Universal Metal Primer B66W310 (one coat) + SW Sher-Cryl HPA B66-300 enamel – two coats.
2. Block Filler on CMU: SW Heavy Duty Block Filler B24W46, one coat.
3. Gloss Enamel on Shop-Primed Metals: SW Sher-Cryl HPA B66-300 gloss enamel-two coats.
4. Gloss Enamel on Aluminum: SW Pro-Cryl Universal Metal Primer B66W310 – (one coat) + SW Sher-Cryl HPA B66-300 gloss enamel – two coats.
5. Field Welds: “ZRC” cold-applied galvanizing.

PART 3 - EXECUTION

3.1 PREPARATION

- A. METALS: Remove grease, oil, and dirt. Touch-up any damaged primer with like material. Remove any welding tags and grind smooth before painting. Fill any open galvanizing ports.
- B. PLASTER, CMU, CONCRETE: Remove dusting and mortar residue. Remove any efflorescence and seal. Ensure that plaster, concrete and mortar joints are dry and fully cured.

3.2 APPLICATION

- A. GENERAL: All paint and finishes be brushed or sprayed in even, uniform coats without runs or sags. Allow each coat to dry completely before applying succeeding coats. All surfaces shall be dry and no painting shall be done in damp conditions or when the ambient temperature is below 50 degrees F.
- B. WOOD DOORS: Factory sealed tops, bottoms, and edges of plastic laminate surfaced doors left undisturbed require no additional finishing. Reseal any job cuts. Paint metal glazing stops.
- C. MECHANICAL/ELECTRICAL EQUIPMENT: Painting contractor shall examine the mechanical and electrical drawings to determine quantities and locations of exposed piping, louvers not shown in Architectural drawings, electrical and telephone panels in finished areas, exposed electrical conduit in finished areas.
- D. BLOCK FILLER AT CMU: Apply **first coat** of filler to ensure penetration into voids and work into block texture with bristle brush. Follow with a **minimum of one additional coat**. Provide uniform finish with no pinholes.
- E. DRYWALL: Paint finish, sheen and texture shall be uniform and match the samples submitted to and approved by the Architect.

3.3 PREPARATION OF EXISTING PAINTED SURFACES

- A. Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease. Loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thoroughly washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

PART 4 – SCHEDULES

4.1 COLOR SELECTIONS

- A. SCHEDULE: Unless colors are pre-selected in the Bidding Documents, the Architect shall prepare color schedule for the project using colors selected from the approved paint manufacturer(s). Where colors are pre-selected, the painting contractor shall use the colors selected or submit a schedule of proposed exact color matches by one of the specified paint manufacturers. **Provide 12" x 12" samples of actual paint for each color** whether pre-selected color or proposed color match.
- B. DOCUMENTATION: Upon completion of the Project, painting contractor shall furnish to the Architect a complete schedule of paint brands, types, and colors actually used for each room and area.

4.2 EXTRA MATERIALS

- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color (field and accent) of paint used.

END OF SECTION

SECTION 10 14 00 — GRAPHICS AND SIGNAGE**PART 1 - GENERAL****1.1 COORDINATION:**

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Material and installation for the Plastic Room Identification Plaques.
- B. Material and Installation for Exterior/Interior Building Identification Letters.
- C. Material and Installation For Building Dedication Plaque with logos (including but not limited to conversion of architectural drawings into useable vector line art format).

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Interior wall materials and finishes.
- B. Exterior wall materials and finishes.
- C. Typical handicapped site signage.

1.4 SUBMITTALS

- A. Submit manufacturer's product data describing materials, and mounting methods for Room Identification Plaques, Exterior/Interior Building Identification Letters, and Building Dedication Plaque.
- B. Submit color samples of actual material for color and finish selection by Architect.
- C. Submit finished sample of room identification plaque(s) with any required symbols other than text.
- D. Submit paper "rubbing" of final layout of Building Dedication Plaque for Architect's approval.
- E. Submit full size paper layout of Exterior Building Identification Letters for each line of text.
- F. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to color fading, delamination, failure of anchoring or fastening, cracking, breaking or tarnishing.
- C. Exterior signage or building letters contributing to streaking or staining of building shall be a defect to be corrected by the Contractor, with building materials cleaned or replaced as required.

1.6 QUALITY ASSURANCE

- A. Fabrication and installation company shall have a minimum of 3 years experience in the installation of similar systems for projects of similar size and scope.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver materials to the jobsite until surfaces are ready for installation of graphics.
- B. Store materials in covered, dry, temperature and humidity controlled space.

2 PART TWO – PRODUCTS

2.1 MANUFACTURERS

- A. ROOM IDENTIFICATION PLAQUES:
 1. Corpus Christi Stamp Works
 2. Sign International
 3. Multi-Graphics Incorporated
- B. EXTERIOR BUILDING IDENTIFICATION LETTERS:
 1. A.R.K. Ramos
 2. Gemini Inc.
 3. Matthews Architectural Products
 4. Sign International
- C. BUILDING DEDICATION PLAQUE:
 1. A.R.K. Ramos
 2. Matthews Architectural Products
 3. The Southwell Co.
 4. Sign International

2.2 MATERIALS

- A. ROOM IDENTIFICATION PLAQUES:
 1. 6" X 9" X 1/4" thick two tone series:
 2. Fabrication: Constructed of Wilson Art face laminate (as selected by the Architect from manufacturer's standard selections) laminated to a solid acrylic core. The raised 1/32" acrylic copy

shall be cut through the laminate face color and chemically welded to the acrylic core to assure permanent attachment, including the symbols. Any lower and secondary copy shall be 5/8" high Helvetica Medium (all caps) incised copy paint filled. Colors as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable. The edge of the signs shall be finished to match the face laminate color-to-color as selected by the Architect.

3. At toilet rooms also provide with 2" high raised gender and wheelchair symbols when handicapped equipped noted on schedule. Symbols shall be chemically welded through the face laminate to the acrylic core. Edges painted a color as selected.
4. The raised copy shall be accompanied with grade 2 Braille by means of Visi Touch DuraDot Braille manufacturing system. The clear Glass DuraDot shall have a 0.059 surface diameter and raised 1/32" above the face laminate and shall be unitized to the acrylic core through the face laminate. The edges of the sign shall be finished to match the face laminate color-to color as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable.
5. Installed plaques shall comply with all state, local, and federal requirements for compliance.

B. EXTERIOR BUILDING IDENTIFICATION LETTERS

1. Scope: The project shall include a cast letters as described below, to be provided and installed by contractor. Letterstyle, finish and mounting to be selected by Architect.
2. Fabrication of Letters: Fabricate letters to comply with requirements indicated below and as indicated on drawings.

A . Cut letters : Form letters by cutting from solid sheet material of thickness specified. Produce characters with smooth flat faces, sharp corners, precisely formed lines and profiles, free from pits, scale, sand holes and other defects. Supply anchoring devices on reverse side of individual letters as required.

3. Characteristics:
 - A. Metal: Aluminum
 - B. Size: 6 inches unless noted otherwise on drawings.
 - C. Thickness: 1 1/2 inches.
 - D. Letterstyle: Sans Serif
 - E. Finish: As selected by Architect from manufacturer's finish options (submit samples).
 - F. Mounting: Concealed (refer to drawings for wall type).
 - G. Text: "STARR COUNTY COURTHOUSE" (To be confirmed by Owner)
4. Template: Provide full size paper mounting template showing hole placement and location of mounting holes.
5. Finishes: Colors and surface textures for exposed letters as selected by the architect from the manufacturer's standard and premium selections.

C. BUILDING IDENTIFICATION PLAQUE:

1. 18" wide X 24" high cast bronze alloy plaque. Borders and raised text shall have satin finish. Background shall receive a dark oxidized leatherette finish. Faces and edges to be chemically cleaned and sprayed with two coats of clear acrylic lacquer.
2. Provide threaded stainless steel or brass studs on back for concealed mounting with epoxy. Letter style "Helvetica Medium" per A.R. Ramos or equivalent by specified manufacturer.

3. Layout, logos and letter sizes to be provided by the Architect. General contractor shall perform all conversions of architectural drawings & logos into useable vector line art format or any other type of format as required in order to produce the building plaque layout as provided by the Architect.

3 PART THREE- EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Ensure that wall surfaces are completed and accepted by the Architect prior to installing wall-mounted items or painted wall graphics.
- B. Obtain approved location schedule for Room Identification Plaques prior to delivery of plaques to the jobsite.

3.2 INSTALLATION

A. ROOM IDENTIFICATION PLAQUES:

1. Apply top and bottom strips of 1/8" thick double stick vinyl foam tape and backs of each plaque. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of plaque.
2. Plaques shall be mounted to the strike side of the door on the wall within 5' of the floor and 6" max. from the jamb; when location is on a glass side light or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

B. BUILDING DIRECTIONALS SIGNS:

1. Apply top and bottom strips 1/8" thick double stick vinyl foam tape on backs of each sign. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of sign.
2. Signs shall be mounted to the strike side of the door on the wall within 5' of the floor and 6" max. from the jamb; when location is a glass sidelight or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

C. EXTERIOR/INTERIOR BUILDING IDENTIFICATION LETTERS.

1. Pre-drill holes into masonry and insert threaded stud on back of letters into epoxy adhesive filled holes. Provide stainless steel spaces to set letters off wall 1/2" minimum 2 studs per letter. Refer to drawings for wall finish type.

D. BUILDING IDENTIFICATION PLAQUE:

1. Masonry Wall: Pre-drill holes into masonry walls and insert threaded studs on back of letters into epoxy adhesive filled holes. Mount plaque tight against wall.
2. Drywall: Mount plaque using a minimum of 4 moly type expansion screws and silicone adhesive. Mount plaque tight against wall.

END OF SECTION

SECTION 10 14 53 — TRAFFIC STRIPING AND PARKING SIGNAGE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide traffic line, parking stripe and symbol painting on concrete/asphalt paving as indicated in the drawings.
- B. Provide and install pipe-mounted parking signs at handicapped parking spaces meeting requirements of ADA.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Reinforced concrete paving.

1.4 SUBMITTALS

- A. PAINT: Submit manufacturer's product literature indicating Federal specification numbers and manufacturer's recommended use and application techniques.
- B. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.
- C. Provide full size template for handicapped stall symbol.

1.5 WARRANTY

- A. Provide written warranty against defects in material and workmanship for a period of one year after date of Substantial Completion.
- B. Warranted defects for paint striping shall include but not necessarily be limited to fading, bleed-thru, spalling, excessive wear or delamination.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PAINT: "PRO-PARK" Waterborne Traffic Marking Paint, B97 Series alkyd base marking paint meeting Federal Specifications TTP-85 and TTP-115 Type 1 as manufactured by Sherwin Williams or equivalent.
 - 1. Width: Typically 4 inches unless indicated otherwise in the drawings.
 - 2. Colors:
 - a. White: Traffic lines, directional symbols, symbols for the handicapped.
 - b. Yellow: Striping for parking stalls.
- B. HANDICAPPED PARKING SIGNS:
 - 1. Provide sign size, colors and copy meeting state, local and federal requirements for handicapped parking signage.
 - 2. Sign blank shall be 1/8" aluminum sheet with Axalta "Emron" glass paint background, graphics and copy.
 - 3. Graphics and copy shall be photo silk screened.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ensure that paving operations are complete and surfaces thoroughly dry, clean, and free of oil or grease stains or other contaminants.
- B. Clean with high pressure wash or brush if necessary for proper adhesion.

3.2 PAINT

- A. Spray apply two coats of marking paint in patterns indicated on the drawings after weathering of asphalt or concrete paving for a minimum of 30 days. Edges shall be sharply defined.
- B. Provide minimum dry thickness of 2.5 mils. Provide additional coats if required for complete hiding.

3.3 HANDICAPPED PARKING SIGNS: Set 2" galvanized pipe sign support in minimum 6" diameter x 24" deep concrete footing.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide and install **solid phenolic toilet partition system and urinal screens** as indicated in the drawings, the approved shop drawings and as specified herein.
- B. Provide and install all toilet room and shower accessories as indicated in the drawings and as specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Wood blocking between studs.
- B. Wall and floor finishes.
- C. Electrical power provided.

1.4 SUBMITTALS

- A. **SOLID PHENOLIC PARTITION SYSTEMS:**
 1. Submit shop drawings for solid phenolic partition system indicating plan and elevation dimensions and mounting details. Submit hardware samples and full chain of melamine samples for partition doors.
 2. Shop drawings indicating handicapped stall layouts not meeting State and Federal requirements will be returned and rejected without review.
- B. **ACCESSORIES:**
 1. Submit manufacturer's product data describing size, type, finish and installation requirements for each item.
 2. Indicate mounting heights for each item. Meet State and Federal requirements for the handicapped.
- C. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.
- B. Warranted defects shall include but not necessarily be limited to delamination of facing or edging, swelling of core, change in alignment of parts, failure of anchorage or fasteners.
- C. Provide manufacturer's extended written warranty for systems and accessories where available.

1.6 QUALITY ASSURANCE

- A. Partition system installation company shall have a minimum of 5 years experience in the installation of similar system for projects of similar size and scope.
- B. Partition system installation company shall be authorized by the system manufacturer for this installation.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver partition system materials to the job site in manufacturer's original packaging.
- B. Store materials in covered, dry, temperature and humidity controlled space.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. SOLID PHENOLIC PARTITION SYSTEMS:
 - 1. Bobrick Washroom Equipment
 - 2. American Specialties, Inc.
 - 3. Ampco
 - 4. Scranton Products
- B. ACCESSORY MANUFACTURERS:
 - 1. Bobrick Washroom Equipment
 - 2. Bradley Wash Fountain Co.
- C. PAPER TOWEL DISPENSERS:
 - 1. Bobrick Washroom Equipment

2.2 TOILET ROOM ACCESSORIES:

- 1. Grab bars: Furnish and install grab bars at each handicapped toilet stall. Bars shall be Bobrick No. B-6806 series, 1-1/2" outside diameter, satin finish stainless steel, configuration as indicated on the drawings, 1-1/2" clear to wall. **Where bars are mounted over back of toilet, General Contractor shall hold flush valve low.**
- 2. Mirrors: Mirrors shall be 1/4" plate glass, mirror quality, with copper backs. Provide polished stainless steel or brass chrome plated frames in sizes indicated on the drawings.
 - a. Tilted mirrors shall be Bobrick No. B-293 or equivalent by specified manufacturer.
 - b. Flat mirrors shall be Bobrick No. B-290 or equivalent by specified manufacturer.
- 3. Mop Holder: Bobrick B223X24 stainless steel. Furnished and installed by Contractor.

4. Soap dispensers: Bobrick Contura Series Surface Mounted Soap Dispenser Model B-4112. Furnished and installed by Contractor.
5. Tissue dispensers: ClassicSeries Surface-Mounted Toilet Tissue Dispenser for Two Rolls Model B-265 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.
6. Paper Towel Dispensers: Recessed Paper Towel Dispenser and Waster Receptacle shall be Model B-369 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.

2.3 SOLID PHENOLIC PARTITION SYSTEMS:

A. STILES, PANELS, DOORS, SCREENS, BENCHES

1. Solid phenolic material constructed of solidly fused plastic laminate with matte-finish melamine surfaces, colored face sheets, and black phenolic-resin core that are integrally bonded. Edges shall be black. Brown edges shall not be acceptable. Color and pattern as selected by architect from manufacturer's standard colors.
2. Solid phenolic material shall meet National Fire Protection Association and International Building Code Interior Wall and Ceiling Finish Class A, Uniform Building Code Class I, ASTM E-84 Fire Resistance Standards; flame spread 20, smoke density 95.
3. Finish Thickness
 - a. Stiles and doors shall be 3/4" (19mm).
 - b. Panels and benches shall be 1/2" (13mm).

B. HARDWARE

1. All hardware to be 18-8, type-304 stainless steel with satin-finish.
2. All hardware shall be concealed inside compartments with the exception of outswing doors.
3. Hardware of chrome-plated "Zamak" is unacceptable.

C. LATCH

1. Sliding door latch shall be 16-gauge (1.6mm).
2. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.
3. Latch track shall be attached to door by flathead machine screws into factory installed threaded brass inserts.
4. Latch handle shall have rubber bumper to act as door stop.
5. Latch shall allow door to be lifted over 16-gauge (1.6mm) keeper for emergency access.
6. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.

D. HINGES

1. Cam shall be adjustable in the field to permit door to be fully closed or partially open when compartment is unoccupied.

2. Hinges shall be attached to door and stile by theft-resistant, one-way stainless steel machine screws into factory-installed metal inserts. Fasteners secured directly into the core are not acceptable.
3. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.

E. Clothes Hook shall be constructed of stainless steel and shall project no more than 1-1/8" (29mm) from face of door. Clothes hook shall be secured by theft-resistant, one-way stainless steel screws.

F. Mounting Brackets shall be constructed of stainless steel and shall be mounted inside compartment. Mounting brackets exposed on the exterior of the compartment will not be acceptable. Wall mounted urinal screen brackets shall be 11-gauge (3mm) double thickness.

G. Leveling Device shall be 3/16" (5mm) hot rolled steel bar; chromate-treated and zinc-plated; through bolted to base of solid phenolic stile.

H. Stile Shoe shall be one-piece, 4" (102mm) high, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Top shall have 90° return to stile. Patented one-piece shoe capable of adapting to 3/4" or 1" stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

I. Headrail (Overhead-Braced) shall be satin finish, extruded anodized aluminum (.065" / 1.65mm thick) with anti-grip profile. Type: Floor mounted, overhead braced continuously over entire system.

2.4 ELECTRIC HAND DRYERS:

1. Hand Dryers:
 - a. Provide and install No. B-750 115V Recessed Aircraft Automatic Hand Dryer, as manufactured by Bobrick or equivalent by specified manufacturer. Fixed outlet.
 - b. Provide units wired for 115 volt AC, 20 amps, unless electrical drawings provide other power.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Ensure that Contractor has properly installed solid wood blocking between studs at all mounting points.
- B. Ensure that Contractor has provided coordinated electrical power at each electric dryer location.

3.2 INSTALLATION

- A. Install accessories and partition systems in accordance with the project drawings, approved shop drawings and as specified herein. Use tamper proof stainless steel fasteners for all items.
- B. ACCESSORIES:
 1. Install through finished stud walls into solid wood blocking with stainless steel one-way screws. No plastic anchors.
 2. Attach to masonry walls using stainless steel machine screws in lead shield anchors.

C. PARTITION SYSTEMS AND URINAL SCREENS:

1. Mount channels using stainless steel one-way screws through finished stud walls into solid wood blocking.
2. Mount channels to masonry walls using stainless steel machine screws in lead shield anchors.
3. Job measure for proper fit and to ensure that the maximum space between edge of any pilaster or panel and its adjacent surface is one inch.
4. Install pilaster, doors and panels plumb and square. Adjust doors for gravity closing.

D. FRAMED MIRRORS:

1. Mirrors shall be installed with theft-proof anchors at height shown on drawings. Furnish tilted mirrors where shown.
2. Install mirrors at other locations in addition to toilet rooms as indicated in the drawings.
3. Unframed mirrors are provided and installed under another section of these specifications.

END OF SECTION

SECTION 10 28 13 - TOILET & BATH ACCESSORIES**PART 1 GENERAL****1.00 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SECTION INCLUDES

- A. Vertical or Horizontal Baby Changing Stations and Child Protection Seat for use in commercial men's and women's toilet and bath facilities.

1.02 QUALITY ASSURANCE

- A. Regulatory, Requirements: Conform to ASTM F2285 (formerly ASTM PS125) Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use, ANSI A117.1 Accessible and Usable Buildings and Facilities, ANSI Z535.4 Product Safety Signs and Labels, German TUV Technical Inspection Association, or local code if more stringent installation requirements are applicable for barrier-free accessibility. FDA approved high-density polyethylene (HDPE) materials conform to ASTM G21 Antifungal, and ASTM G22 Antibacterial Standards.

1.03 WARRANTY

- A. Submit manufacturer's 5-year limited warranty on materials and workmanship and 5-year replacement warranty against vandalism agreeing to repair or replace unit that fails to perform as intended from date of substantial completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Acceptable Manufacturers: Koala Kare Products, a Division of Bobrick, Englewood, CO, 877-284-3906

2.02 ACCEPTABLE PRODUCTS

A. Baby Changing Stations

1. Horizontal Design with molded Braille instructions (Model KB100-00)
2. Vertical Design with molded Braille instructions (Model KB101-00)
3. Stainless Steel Recessed Mounted Horizontal Design (Model KB110-SSRE)
4. Stainless Steel Surface Mounted Horizontal Design (Model KB110-SSWM)

B. Sanitary Liner Refills. Liners are for use with all Koala Baby Changing Station designs (Model KB150-99).

2.03 MATERIALS

- A. Materials/finishes: {[Molded FDA approved high density polyethylene HDPE, cream color] (Models KB100-00, KB101-00, KB102-00)} {[18 gauge, type 304 satin stainless steel exterior finish with grey polyethylene interior (Models KB110-SSRE, KB110-SSWM)}.
- B. Hinges: reinforced, full-length steel-on-steel.
- C. Mounting supports: multiple, 11-gauge steel.
- D. Operation: hidden pneumatic gas spring mechanism for safe open/close motions.

2.04 ACCESSORIES

- A. Integral, built-in Liner Dispenser for use with 3-ply chemical-free biodegradable 13" x 19" sanitary liners.
- B. Replaceable snap-lock protective holding straps.
- C. Molded graphic instructions and safety messages in 6 languages and Braille. Identifying door plaque.
- D. Optional antimicrobial polyethylene.
- E. Optional lock supplied with 2 keys (not available for stainless steel exterior finish models).

PART 3 EXECUTION

3.01 PREPARATION

- A. Provide templates and rough-in measurements as required.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's hardware and instructions.
- B. Locate products to eliminate interference with door swings or use of fixtures in compliance with ADA regulations

END OF SECTION

SECTION 10 44 00 - FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.0 COORDINATION

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED SECTIONS

- A. Section 04 22 00 – Concrete Masonry Units; CMU walls to receive bracket mounted fire extinguisher.
- B. Section 06 10 00 – Rough Carpentry: Wood blocking and framing to receive semi-recessed fire extinguisher cabinets.
- C. Section 09 21 16 – Gypsum Drywall Assemblies: Finished openings in walls for semi-recessed fire extinguisher cabinets.

1.03 REFERENCES

- A. NFPA 10 – Standard for Portable Fire Extinguishers; National Fire Protection Association; 2002.
- B. UL (FPED) – Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

- A. See Section 01 33 00 – Submittals, procedures and requirements for shop drawings, product data and submittal requirements.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers, Cabinets and Accessories:
 - 1. JL Industries, Inc; Product 1037B20 with Extinguisher: www.jlindustries.com.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 3. Potter-Roemer: www.potterroemer.com.
 - 4. Substitutions: See Section 01 25 00 – Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Basis of Design: JL Industries, "Cosmic 10E".
- B. Type: Multipurpose dry chemical.
- C. Rating: Sized for project requirements.
- D. Mounting: Refer to floor plans for locations, annotated FEC for cabinets and FE extinguishers alone.
- E. Dry Chemical Type: Stainless steel tank, with pressure gage.
 - 1. Class A:B:C.
 - 2. Size 10.
 - 3. Finish: Baked enamel, Red color.
- G. ALL fire extinguishers shall be inspected and certified by the local authority having jurisdiction that they are charged and ready for use and shall be "tagged" identifying such.

2.03 FIRE EXTINGUISHER CABINETS

- A. Basis of Design:
 - 1. JL Industries, "Cosmopolitan – 1035B20 ADAC with Saf-T-Loc, TAS compliant.
 - 2. Designations: Refer to the floor plans, FEC for Extinguishers in cabinets and FE for surface mounted extinguishers secured to walls.

- B. Surface Mounted (Non-Cabinet, FE Type) – Bracket and Extinguisher (non-cabinet): Manufacturer's standard stainless steel strap with enamel finished bracket with locking band retainer.
 - 1. Bracket shall match the extinguisher type.
- C. Metal for Cabinets: Formed stainless steel sheet; 0.036 inch thick base metal; #4 finish stainless steel.
- D. Cabinet Configuration: Recessed type.
 - 1. Sized to accommodate accessories.
 - 2. Exterior nominal dimensions of 13 7/8 inch wide x 27 3/8 inch high x 6 inch deep.
 - 3. Trim: Returned to wall surface, with 3 inch projection, 1 1/2 inch wide face.
 - 4. Form cabinet enclosure with right angle inside corners and seams. Form perimeters trim and door stiles.
- E. Door: 0.036 inch thick, reinforced for flatness and rigidity; lock with full glass access. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.
- F. Door Glazing: Glass, clear, 1/8 inch thick float. Set in resilient channel gasket glazing.
- G. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- H. Weld, fill, and grind components smooth.
- I. Finish of Cabinet Interior: Enamel, color to select from manufacturer's full color line.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Cabinet Signage: FIRE EXTINGUISHER, vertical up face of cabinet to one side.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

SECTION 31 10 00 — SITE CLEARING, GRADING AND FILLING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Clearing, filling and grading of the affected areas of the site.
- B. Top Soil removal and reuse.
- C. Disposal of debris and surplus materials.
- D. Protection of trees and vegetation to remain, coordinate with the Architect.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS:

- A. Excavation and backfilling for underground site utilities.
- B. Paving and sidewalks.
- C. Site drainage systems.

1.4 QUALITY ASSURANCE

- A. Testing Laboratory Services: Installed materials shall meet specified requirements as determined by the Owner's Testing Laboratory.
- B. Proposed sitework contractor shall be able to provide documentation that he has a minimum of three years of satisfactory experience in the performance of similar operations.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Existing top soil to be stockpiled and reused.
- B. Existing and off-site earth fill as required.
- C. TOPSOIL:
 - 1. Rich sandy loam, low in silt, free of trash, rocks, debris and other foreign materials.
 - 2. Topsoil stripped at the site and stockpiled may be used if material meets the above requirements and quantities are sufficient to meet all topsoil needs of the site. Otherwise topsoil meeting specified requirements and approved by the testing laboratory shall be provided from an approved off site source.
- D. FERTILIZER AND GRASSING: Provide grass to replace any disturbed areas during regarding.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING TREES AND VEGETATION

- A. GENERAL: In addition to any temporary construction fencing provided under Section 01 50 00 Temporary Facilities, provide temporary chain link fencing around existing shrubs, grasses, ground cover and tress indicated to remain. Locate fencing around drip lines of individual trees or groups of trees.
- B. REPLACEMENT: Replace damaged existing trees and vegetation indicated to remain with materials of like kind, size and maturity as approved by the architect. Follow supplier's recommended procedures of planting.

3.2 TOPSOIL REMOVAL AND EXCAVATION

- A. Strip topsoil to a depth of 4" to 6" under all new site paving, sidewalks, within new building lines and at all site areas which will receive earth fill for grading adjustments.
- B. Temporarily store removed topsoil at an on-site location designated by the Architect. Stored topsoil shall be kept free of trash and construction debris.
- C. Remove additional existing soil as required to achieve any finish paving grades which may be at or near natural grade elevation.

3.3 EXCAVATING, GRADING AND FILLING

- A. GRADE ELEVATIONS: Establish finish grades as indicated on the drawings. Set and maintain grade stakes.
- B. ROUGH GRADING:
 - 1. Provide clean earth fill meeting specified requirements from off-site should additional earth fill be required.
 - 2. Provide temporary and permanent drainage swales, pumps, gutters and trenches necessary to dry existing soil and carry off water during construction. As indicated on drawings shape the site around structures to drain away from the building(s) at all times. Do not allow water to stand around trees scheduled to remain.

3. All site fill at unpaved and typical sidewalks areas shall be thoroughly compacted in lifts as specified below. Each layer and subgrade shall be wetted or dried as required to achieve optimum moisture content and then compacted to minimum ninety (90%) percent Proctor density per ASTM D1557. The subgrade shall be thoroughly and completely scarified before wetting and rolling.

C. COMPACTION: Compaction may be obtained by any of the following methods:

1. By sheepfoot rollers having a unit weight on the contact feet of not less than 300 pounds per square inch with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
2. By pneumatic tired rollers having a minimum compression of 325 pounds per inch of width of tire tread, with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
3. For those portions of fill which cannot be reached with the sheepfoot roller, such as corners and areas adjacent to columns, beams, etc., mechanical tampers shall be employed to obtain specified compaction.

D. EXISTING UTILITIES:

1. Arrange with utility companies for removal or relocation of any existing utilities.
2. Remove abandoned utilities up to the property line and provide permanent watertight cap.
3. If unknown or uncharted utilities are encountered during excavation, promptly notify the Architect before proceeding. Damage to existing utilities by continuing work without notifying the Architect shall be repaired by the Contractor at no additional cost to the Owner.

E. FINISH GRADING;

1. After rough grading and proof rolling operations are complete, install 2" of topsoil over unpaved open area (within the limits of grading) and fine grade to finish contours and make ready to receive grass planting (whether or not grass planting is required under this contract).
2. Open areas shall be raked smooth and left free of clumps, trash, debris and vegetation. Finish grading shall be uniform in planarity, meeting elevations and slopes as indicated on the drawings, and as required to ensure proper drainage.

3.4 DISPOSAL:

1. Adhere to Federal, State, County and local regulations regarding disposal of removed trees, shrubs, vegetation, soil, and rubble. It is the sole responsibility of the Contractor to determine the regulations regarding on-site burning of removed trees and vegetation.
2. Upon completion of fine grading operations, any excess soil shall be removed from the site, stockpiled at the site, or relocated to any property controlled by the Owner within five miles of the site. The above options shall be as determined by the Owner at no additional cost to the Owner.

END OF SECTION

SECTION 31 31 16 - TERMITE CONTROL**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

- A. Submittals: Product Data and product certificates signed by manufacturer certifying that products used comply with U.S. EPA regulations for termiticides. Include application instructions and EPA-Registered Label.
- B. Engage a licensed professional pest control operator to apply termite control solution.

PART 2 - PRODUCTS**2.1 TERMITICIDES**

- A. Provide an EPA-registered termiticide (5 year) complying with requirements of authorities having jurisdiction, in a soluable or emulsible, concentrated formulation that dilutes with water or foaming agent. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Prepare surfaces and apply treatment at rates and concentrations recommended in manufacturer's written instructions.
- B. Apply termite control to the following:
 1. At foundations. (Piers, mid-span supports)
 2. Under sub-floors and flooring materials.

3. Under basement floor slabs.
4. At hollow masonry.
5. At expansion and control joints and slab penetrations.
6. At crawlspaces; treat soil under and adjacent to foundation supports. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment.

C. Post warning signs in areas of application.

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

END OF SECTION

SECTION 32 11 00 — FLEXIBLE BASE**PART 1 - GENERAL****1.00 COORDINATION**

- A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.01 GENERAL DESCRIPTION OF WORK:

1. This work shall consist of furnishing and placing a foundation course for surface courses or for other base courses.
2. Flexible base shall be composed of either caliche (argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, sand or other granular materials), crushed stone, gravel, iron, or topsoil, shell, or crushed slag.
3. Flexible base shall be constructed as specified herein in one or more courses in conformance with details, lines and grades shown on the plans, and as established by the ENGINEER.

PART 2 - PRODUCTS**2.01 MATERIALS**

1. Materials for flexible base shall be crushed or uncrushed as necessary to comply with the requirements hereinafter specified.
2. Materials shall consist of durable course aggregate particles mixed with approved binding materials.

2.02 LIME STABILIZATION:

1. The material for flexible base shall be lime stabilized.

2.03 TYPES:

1. Type A - Crushed or broken aggregate (excluding gravel aggregate).
2. Type B - Gravel Aggregate
3. Type C - Iron Ore Topsoil
4. Type D - Shell Aggregate with Sand Admixture
5. Type E - Shell Aggregate with Sand and Caliche Ad mixture
6. Type F - Caliche
7. Type G - Crushed Slag
8. Unless otherwise noted on the plans, the CONTRACTOR may use any one type of these types provided the material used meet the requirements set forth in the specification test limits herein.

2.04 GRADES:

- Unless otherwise shown on the plans or directed by the ENGINEER, the final course of base material shall consist of Grades 1, 2, 3, or 4 as specified in Table 02601-1.
- Base courses or subbase materials, unless otherwise noted on the plans or directed by the ENGINEER, may consist of Grades 1, 2, 3, or 4 as specified in Table 02601-1.
- All grades shall, when tested in accordance with standard laboratory test procedures, meet the physical requirements set forth in Table 02601-1.
- Testing of flexible base materials shall be in accordance with the following test procedures:

TESTTESTING PROCEDURE

Preparation for soil constants and sieve analysis	TEX-101-E
Liquid Limit	TEX-104-E
Plastic Limit	TEX-105-E
Plasticity Limit	TEX-106-E
Sieve Analysis	TEX-110-E
Wet Ball Mill	TEX-116-E
Triaxial Test	TEX-117-E (Part I or II)

- Unless otherwise specified on the plans, samples for testing the material for Soil constants, Graduation and Wet Ball Mill shall be taken prior to the compaction operations.
- Unless otherwise specified on the plans, samples for triaxial tests shall be taken from the stockpile or from production, as directed by the ENGINEER, where stockpiling is required and from production where stockpiling is not required.

PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS				
GRADES				
TYPES	Grade 1:	Grade 2:	Grade 3:	Grade 4:
	(Triaxial class 1 Min. compressive Strength, psi: 45 at 0 psi lateral pressure and 175 at 15 psi lateral pressure	(Triaxial class 1 to 2.3) Min. compressive strength, psi: 35 at 0 psi lateral pressure and 175 at 15 lateral pressure	(Unspecified Triaxial Class)	
TYPE A Crushed or Broken Aggregate (excluding gravel aggregate)	Retained on % Sq. Sieve 1-3/4.....0 7/8".....10-35 3/8".....30-50 No. 4.....45-65 No. 40.....70-85 Max LL.....35 Max PI.....10 Wet Ball Mill Max Amt.....40 in Passing	Retained on % Sq. Sieve 1-3/4".....0-10 No. 4.....45-75 No. 40.....60-85 Max LL.....40 Max PI.....12 Wet Ball Mill Max. Amt.....50 Max increase in passing No. 40.....20	Retained on % Sq. Sieve 1-3/4".....0-10 No. 40.....60-85 Max LL.....45 Max PI.....15 Wet Ball Mill Max. Amt.....55 Max increase in passing No. 40.....20	As Shown On Plans

	No. 40.....20			
TYPE B Gravel Aggregate		Retained on Sq. Sieve % 12-2/4".....0-10 No. 4.....30-75 No. 40.....70-85 Max LL.....35 Max PI.....12	Retained on Sq. Sieve % 1-3/4".....0-5 No. 4.....30-75 No. 40.....65-85 Max LL.....35 Max PI.....12	As Shown On Plans
TYPE C Iron Ore Topsoil		Retained on Sq. Sieve % 2-1/2".....0 No. 40.....50-85 Max LL.....35 Max PI.....12	Retained on Sq. Sieve % 2-3/4".....0 No. 40.....45-85 Max LL.....35 Max PI.....12	As Shown On Plans
TYPE D Sand-Shell		Retained on Sq. Sieve % 1-3/4".....0-10 No. 4.....45-65 No. 40.....50-70 Max LL.....35 Max PI.....12	Retained on Sq. Sieve % 1-3/4".....0 No. 40.....45-65 Max LL.....35 Max PI.....12	As Shown On Plans
TYPE E Shell with Sand and Caliche		Retained on Sq. Sieve % 1-3/4".....0 No. 40.....45-65 Max LL.....35 Max PI.....10	Retained on Sq. Sieve % 1-3/4".....0 No. 40.....45-65 Max LL.....35 Max PI.....12	As Shown On Plans
TYPE F Caliche		Retained on Sq. Sieve % 1-3/4".....0 No. 4.....45-75 No. 40.....50-85 Max LL.....40 Max PI.....12	Retained on Sq. Sieve % 1-3/4".....0 No. 40.....50-85 Max LL.....40 Max PI.....12	As Shown On Plans
TYPE G Crushed Blast Furnace Slag				As Shown On Plans

7. The limits establishing reasonable close conformity with the specified gradation and plasticity index are defined by the following:

- 1) The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any

individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.

2) The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.05 STOCKPILING:

1. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.
2. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stock - pile for delivery to the road.
3. In loading form the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.
4. If the CONTRACTOR elects to produce the Type a material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the coarse aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.
5. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that combinations of the materials produced fail to meet all of the specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.
6. The central mixing plant shall be either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.
7. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

1. Type roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.
2. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.
3. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material.
4. The surface of the subgrade shall be finished to line and grade as established and in conformity with the typical section shown on the plans, and any deviation in excess of 2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.
5. Sufficient subgrade shall be prepared in advance to insure satisfactory prosecution of the work.
6. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes or other-wise disposed on as directed, and any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the ENGINEER.

3.02 PLACEMENT OF FIRST COURSE-TYPE A, TYPE B, TYPE C, TYPE F, AND TYPE G MATERIAL:

1. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section.
2. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered in each 100-foot station.
3. Material deposited upon the subgrade shall be spread and shaped the same day.
4. In the event inclement weather or other unforeseen circumstances render impractical the spreading of the material during the first 24-hour period, the material shall be scarified and spread as directed ENGINEER.
5. The material shall be sprinkled, if directed, and shall then be bladed, dragged and shaped to conform to typical sections as shown on plans.
6. All areas and Nests of segregated coarse or fine material shall be corrected to removed and replaced with well graded material, as directed by the ENGINEER.
7. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplies in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.
8. The course shall be compacted by method of compaction hereinafter specified as the Ordinary Compaction method or the Density Control method of compaction as indicated on the plans, or as directed by the ENGINEER.
 1. When the Ordinary Compaction method is to be used, the following provisions shall apply:
 - 1) The course shall be sprinkled as required and rolled as directed until a uniform compaction is secured. Throughout this entire operation, the shape of the course shall be maintained by blading and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lines and grades.
 - 2) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping, and recompacting by sprinkling and rolling.
 - 3) All irregularities, depressions or weal spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.
 2. When the Density Control method of compaction is to be used, the following provisions shall apply:
 - 1) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under Density.
 - 2) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.
 - 3) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet this requirements.
 - 4) Throughout this entire operation, the shape of the course shall be maintained blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lines and grades.
 - 5) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16 feet measured longitudinally shall be corrected by

loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

- 6) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.
- 9. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete, it shall be recompacted and refinished at the sole expense of the CONTRACTOR.
- 10. Where Type C material is used, the material shall be scarified, thoroughly wetted, mixed, manipulated, and bladed so as to secure a uniformly wetted material, and pulled in over the subgrade in courses and set under the action of blading and rolling. The work of mixing, blading, rolling, shaping and subsequent maintenance shall be performed by the continuous use of sufficient number of satisfactory rollers and power maintainers with adequate scarifier attachments.

3.03 PLACEMENT OF FIRST COURSE – TYPE D MATERIAL:

- 1. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section, and corrections made if necessary.
- 2. All materials shall be delivered in approved vehicles of a uniform capacity.
- 3. The required amount of shell shall be uniformly spread across the section and allowed to dry sufficiently to insure proper slaking and mixing of the binder material. Immediately upon completion of the drying period, as determined by the ENGINEER, the specified amount of sand admixture as produce a combined material meeting the requirements hereinbefore specified, shall be spread uniformly across the shell.
- 4. The material shall then be sprinkled as required and thoroughly mixed by blading and harrowing, or other approved methods.
- 5. Failure to proceed with the placing of sand admixtures or mixing and placing operations will be grounds for the suspension of placing of shell.
- 6. Under no condition will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.
- 7. The course shall be compacted by the method of compaction hereinafter specified as the Ordinary Compaction method of the Density Control method of compaction as indicated on the plans, or as directed by the ENGINEER.
 - 1. When the plans indicate that the Ordinary Compaction method is to be used, the following provisions shall apply:
 - 1) After mixing, all material shall be windrowed, and then spread over the section in layers.
 - 2) The layer shall not exceed 2 inches in loose depth.
 - 3) If necessary to prevent segregation, the material shall be wetted in the window prior to spreading.
 - 4) After each lift is spread, it shall be sprinkled and rolled to secure maximum compaction as directed by the ENGINEER. Succeeding layers shall then be placed similarly until the course is completed.
 - 5) All areas and nest of segregated coarse or fine material shall be corrected or removed and replaced with well graded material, as directed by the ENGINEER.
 - 6) The course shall then be sprinkled as required and rolled as directed until a uniform compaction is secured.
 - 7) Throughout this entire operation, the shape of the course shall be maintained by blading,; and the surface, upon completion, shall be smooth and in conformity with the typical sections shown on the plans, and to the established lines and grades.
 - 8) In that area on which pavement is to be place, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

- 9) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.
2. When the plans indicate that the Density Control method of compaction is to be used, the compaction method shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G materials.
8. When indicated on the plans or permitted by the ENGINEER, Type D material may be mixed in a central mixing plant and delivered to the road as a combined mixture. When this method is used, the combined mixture shall meet the requirements for Type D material as hereinbefore specified and the placing and compaction requirement shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.

3.04 PLACEMENT OF FIRST COURSE-TYPE E MATERIAL

1. The construction methods for placing the first course of Type E material shall be the same as prescribed for Type D material except that after the shell and sand have been placed, the prescribed amount of caliche shall then be spread across the sand and shell.
2. The composite mixture shall then be sprinkled as required and thoroughly mixed by blading and harrowing or other approved methods.
3. Compaction of the first course of Type E material shall be the same as prescribed above for Type D material.
4. Failure to proceed with placing the sand and caliche admixture or mixing and placing operations will be grounds for the suspension of placing the shell.
5. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.

3.05 PLACEMENT OF SUCCEEDING COURSES – ALL MATERIAL TYPES:

1. Construction methods shall be the same as prescribed for the first course.
2. Prior to placing the surfacing on the completed base, the base shall be dry cured to the extent directed by the ENGINEER.

3.06 DENSITY CONTROL:

1. When the Density Control method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.
2. The testing will be as outlined in Test Method Tex- I 14-E.
3. It is the intent of this specification to provide in that part of the base included in the top 8 inches immediately below the finished surface of the roadway not less than 100 percent of the density as determined by the compaction ratio method.
4. Field density determination shall be made in accordance with Test Method Tex115-E.

3.07 TOLERANCES:

1. Flexible base will be measured by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.
 1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

1. Flexible base will be measure by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.
 1. The flexible base shall be measured for depth by the units of 2000 square yards, with one measurement taken at location selected by the ENGINEER.
 2. In that unit where flexible base is deficient by more than 2 inch in thickness, the deficiency shall be corrected by scarifying, adding material as required, reshaping and recompacting by sprinkling and rolling.
 3. No additional payment over the contract unit price will be made for any flexible base of a thickness exceeding that required by plans.
2. The CONTRACTOR shall schedule his operations in such a manner as to facilitate the measurement of the pay item.
3. The ENGINEER may accept the work provided no more than 2 out of 10 depth tests performed are deficient by not more 2 inch and where no two consecutive tests on continuous work are outside the specified depth.

4.02 PAYMENT:

1. The accepted quantities of flexible base of the type, grade, and compaction method specified will be paid at the contract unit bid price per square yard, complete in place.
2. Where ordinary Compaction is used, all sprinkling, rolling, and manipulation required will not be paid for directly, but will be incidental to other bid items.
3. The unit prices bid shall each be full compensation for shaping and fine grading the roadbed; for securing and furnishing all materials, including all royalty and freight involved, for furnishing scales and labor involved in weighing the material when required; for loosening, blasting, excavating, screening, crushing and temporary stockpiling when required; for loading all materials for all hauling and delivering on the road; for spreading, mixing, blading, dragging, shaping and finishing and for all manipulation, labor, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 32 31 13 — CHAIN LINK FENCING**PART 1 - GENERAL****1.1 COORDINATION**

- A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.
- B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.
- C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.
- D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

- A. Provide all labor, equipment, and materials for the construction of galvanized chain link fencing and gates at the locations shown on the drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Temporary construction fencing
- B. Concrete

1.4 SUBMITTALS

- A. PRODUCT DATA: Submit manufacturer's literature indicating the performance, fabrication procedures, product variations and accessories.
- B. SUBMITTALS: Submit shop drawings including details illustrating fence height, size of posts, rails, braces, gates, and footings, accessories and erection procedures.
- C. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

- A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 QUALITY ASSURANCE

- A. GENERAL: Provide fences and gates as complete units produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.
- B. EXAMINATION OF CONDITIONS: Installer shall examine the conditions under which the fences and gates are to be installed. Notify the Owner in writing of all conditions detrimental to the proper and timely completion of the work.
- C. QUALIFICATIONS FOR INSTALLER: Erection of the work of this section shall be done by qualified, experienced personnel under direct supervision of fencing manufacturer's field representative.
- D. PRODUCT DELIVERY, STORAGE AND HANDLING: Deliver material in manufacturer's original packaging with all tags and labels intact and legible. Handle and store material in such a manner as to avoid damage.
- E. PRODUCT REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. GENERAL:
 - 1. All materials, fabric fittings, appurtenances, hardware, fasteners, and fabrications (other than aluminum or stainless steel ties) to be hot-dipped galvanized after fabrication; posts and rails may be field cut only when the cut ends will be covered completely and protected by concrete or fittings.
 - 2. Zinc for galvanizing shall conform with the requirements A.S.T.M. B6. Galvanizing of materials shall conform with the following requirements:
 - (a) Pipe: A.S.T.M. A-120 (1.8 oz zinc psf)
 - (b) Hardware and Accessories: A.S.T.M. A-153 (2 oz zinc psf)
 - (c) Chain link fabric: A.S.T.M. A-392, Class II (not less than 1.2 oz zinc psf)
- B. CHAIN LINK FABRIC: One piece of fabric widths, No. 9 gauge wires, 2" mesh typical, 1-3/4" mesh at tennis courts. Copper bearing steel wire, tensile strength 80,000 psi. Hot dipped galvanized after weaving. Top and bottom selvages shall be knuckled for all chain link fabric.
- C. POSTS, RAILS AND BRACES:
 - 1. End, Corner and Pull Posts: 2-1/2" I.D. standard weight, Schedule 40 round galvanized steel pipe; weight 5.79 lbs./linear foot. Install one pull post at the center of FENCE Line and one terminal post at each end and/or change of direction.
 - 2. Line Posts: Typical line posts up to 6' high shall be 2" I.D. standard weight, schedule 40 round galvanized steel pipe, weight 3.65 lbs./linear foot, spaced on 10' centers, maximum. Fabric shall be attached to posts with 9 gauge zinc coated wire ties 12" o.c. maximum. For posts up to 12' high, use 2-1/2" I.D. x 9.11 lbs./linear foot.
 - 3. Top Rail: 1-1/4" I.D. Schedule 40 galvanized steel pipe, weight 2.27 lbs./linear foot furnished in manufacturer's standard lengths of approximately 21'-0" with couplings approximately 6" long for each joint, one coupling in each 5 to have expansion spring. Provide means for attaching top rail to each gate, corner, pull and end posts. Top rail shall form continuous brace from end to end of each run of fence.
 - 4. Post Brace Assembly: Provide bracing assemblies at terminal and gate posts and at both sides of corner and pull posts, with the horizontal brace located at mid-height of the fabric. Use 1-1/4" I.D. Schedule 40 galvanized pipe for horizontal brace and 3/8" diameter rod with turnbuckle for diagonal truss.

5. Tension Wire: 7 gauge galvanized steel spring wire at bottom of fence.
6. Post Tops: Pressed steel, or malleable iron designed as a weathertight closure top for tubular posts. Provide one cap for each post. Provide tops to permit through passage of top rail.
7. Stretcher Bars: One piece lengths steel equal to full height of fabric with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post and 2 for each corner or pull post.
8. Stretcher Bar Bands: Heavy pressed steel or malleable iron, spaced not over 15" o.c. to secure stretcher bars to end, corner and gate posts.
9. Wire Ties: For tying fabric line posts, use minimum 9 gauge aluminum or galvanized steel wire ties for tubular posts spaced 14" o.c. For tying fabric to rails and braces, use 9 gauge aluminum wire ties spaced 24" o.c. For tying fabric to tension wire, use 11 gauge hog rings spaced 24" o.c.
10. Concrete: Conform with requirements of ASTM C-92, 1" maximum size aggregate and at least 4 sacks cement per cubic yard, 3% to 6% entrained air, 3,000 psi at 28 days, maximum 3"slump.

D. SWINGING GATES:

1. Fabricate gate perimeter frames of 1-1/2" I.D. Schedule 40 galvanized pipe; weight 2.72 pounds per linear foot. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware and accessories. Assemble gate frames by welding or fittings and rivets for rigid connections. Use same fabric as for fence. Install fabric with stretchers bars at vertical edges and tie wires at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c. Attach hardware with rivets. Provide diagonal cross-bracing of gate frames by means of 3/8" diameter adjustable length truss rods.
2. Gate Posts:
 - (a) Single leaf 6 ft. or double leaf 12 ft.: 3 inch o.d. 7.58 pounds per foot, ASTM A120, galvanized schedule 50 pipe or 3 inch x 3 inch roll section, ASTM A501, hot dipped galvanized.
 - (b) Single leaf 10 ft. or double leaf 20 ft.: 4 inch o.d. pipe 9.11 pounds per foot, ASTM A120, galvanized schedule 50 or 3 inch x 3 inch roll section ASTM A501.
 - (c) Single leaf 16 ft. or double leaf 32 ft.: 6-5/8 inch o.d. pipe 18.97 pounds per foot, galvanized schedule 50 pipe.

E. GATE HARDWARE:

1. Pressed steel or malleable iron hinges to suit gate size, non-lift off type, offset to permit 180 degree gate opening. Provide 1 pair of hinges for each leaf.
2. Latch: Forked type or plunger-type to permit operation from either side of gates. Provide padlock eye as integral part of latch.
3. Keeper: Provide keeper which automatically engages gate leaf and holds in open position until manually released.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. GENERAL: Obtain approval from Architect for fencing layout, gate locations, direction of gate swings, and corner and end post locations prior to beginning work.
- B. INSTALLING POSTS: All posts shall be spaced not more than 10' apart. Drill holes for post footings in firm undisturbed or compacted soil. The holes shall have a diameter equal to 3 times the diameter of the post (9" minimum). Excavate hole depths approximately 3" lower than post bottom for concrete coverage of post bottom. Set the posts and place concrete around posts in a continuous pour, tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing

operation. Set top of concrete footing 2" above proposed finish grade and finish trowel top of footings with slope or dome to direct water away from posts. Set keepers, stops, sleeves and other accessories into concrete as required.

C. FOOTING DEPTHS:

1. Typical 4' to 6' high fencing
 - (a) Terminal and line posts: Minimum 36" deep.
 - (b) Corner and pull posts: Minimum 48" deep.
2. Gates
 - (a) 36" to 48" wide leaf: Minimum 48" deep.
 - (b) 54" to 72" wide leaf: Minimum 60" deep.
 - (c) 78" to 96" wide leaf: Minimum 72" deep.
 - (d) Tie each pair of gate posts together with 12" x 12" reinforced concrete beam poured with footings. Provide minimum 6" earth coverage over tie beam.

D. CONCRETE STRENGTH: Allow concrete to attain at least 75% of its minimum 28 day compressive strength, but in no case sooner than 7 days after placement, before rails, tension wires, barbed wire, or fabric is installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attained its full design strength, minimum design strength for concrete of 3,000 pounds per square inch at 28 days.

E. INSTALLING TOP AND MID RAILS: To start the installation, a length of top rail shall be run through the first couple of post tops; a rail clamp shall be assembled on the end, corner or gate posts, as the case may be. The end of the rail already placed shall be butted into the clamp and fastened. The top rail shall be installed along the run of the fence and the various sections joined with sleeve couplings. At no more than every 100' an expansion coupling shall be placed to allow for expansion and contractions of the rail. The rail shall be clamped in the end, corner or gate posts at the end of the run of the installation of the top rail.

F. BRACE ASSEMBLIES: Install braces so posts are plumb when diagonal rod is under proper tension. Provide one brace assembly for each gate and end post and two for each corner and pull posts.

G. TENSION WIRE: Install tension wire before stretching fabric and tie to each post with tie ties or clips.

H. INSTALLING FABRIC: Leave approximately 1" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on the outside of the fence and anchor to framework so that fabric remains in tension after pulling fence is released. Stretcher bars shall be threaded through the fabric for seaming it to end, corner, pull and gate posts. The stretcher bars shall be secured to the posts with metal bands spaced not over 15" o.c.

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

J. CLEAN-UP: The Contractor shall remove from the site all tools, equipment, trash, etc, used in this work. Remove all markings from posts and rails.

END OF SECTION

SECTION 22 05 01**COMMON PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for plumbing systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Furnish and install sealants relating to installation of systems installed under this Division.
 - 4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.
- C. Related Requirements:
 - 1. Section 03 30 53: Exterior concrete pads and bases for mechanical equipment.
 - 2. Section 05 05 23: Quality and requirements for welding.
 - 3. Section 07 84 00: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 4. Section 07 92 13: Quality of sealants used at building exterior.
 - 5. Sections Under 09 90 00 Heading: Painting of plumbing items requiring field painting.
 - 6. Section 13 48 00: Sound, Vibration, And Seismic Control.
 - 7. Division 26: Raceway and conduit, unless specified otherwise, and line voltage wiring.
 - 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 - 9. Division 33: Piped utilities.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
- B. Closeout Submittals:
 - 1. Operation And Maintenance Manual Data:
 - a. Modify and add to requirements of Section 01 7800 as follows:
 - 1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included.
 - 2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.
 - 3) Provide operating instructions to include:
 - a) General description of each plumbing system.
 - b) Step by step procedure to follow in putting each piece of plumbing equipment into operation.

- 4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - a) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - b) Manufacturer's maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
- 5) Include copies of warranties required in individual Sections of Division 22.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
- B. Identification:
 1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place.
- 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. Storage:
 1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.
 2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

- A. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- B. Provide certificates of warranty for each piece of equipment made out in favor of Owner.
- C. If plumbing sub-contractor with offices located more than **150 miles 240 km** from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Pipe And Pipe Fittings: Weld-O-Let and Screw-O-Let fittings are acceptable. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA are acceptable.
- B. Sleeves:
 1. In Framing And Suspended Floor Slabs: Standard weight galvanized iron pipe, Schedule 40 PVC, or **14 ga 2 mm** galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- C. Valves: Valves of same type shall be of same manufacturer.
- D. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Drawings:
 1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification of Conditions:
 1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
 2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
 3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
 4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.2 PREPARATION

- A. Changes Due To Equipment Selection:
 - 1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
 - 2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
 - 3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
 - 4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.3 INSTALLATION

- A. Interface With Other Work:
 - 1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 - 2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.
 - 3. Furnish inserts for attaching hangers that are to be cast in concrete floor construction to Division 03 at time floors are poured.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
 - 1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
 - 2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
 - 3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 - 4. Determine exact route and location of each pipe before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
 - 1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
 - 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.

1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe **3/4 inch 19 mm** in diameter and smaller.
 - d. Install piping systems so they may be easily drained
 - e. Install piping to insure noiseless circulation.
 - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
3. Do not install piping in shear walls.
4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
6. Make changes in direction with proper fittings.
7. Expansion of Thermoplastic Pipe:
 - a. Provide for expansion in every **30 feet 9 meters** of straight run.
 - b. Provide **12 inch 300 mm** offset below roof line in each vent line penetrating roof.
8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.

G. Sleeves:

1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade.
2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe penetrations through studs and floor slabs.
3. Sleeves through floors shall extend **1/4 inch 6 mm** above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:

1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.4 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 2. Surface finishes shall exactly match existing finishes of same materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

2. Replace material or workmanship proven defective with sound material at no additional cost to Owner. Repeat tests on new material, if requested.

3.6 CLEANING

- A. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

3.7 CLOSEOUT ACTIVITIES

- A. Instruction of Owner: Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.8 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

END OF SECTION

SECTION 22 05 29**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for plumbing systems.
- B. Related Requirements:
 - 1. Section 05 05 23: Quality and requirements for welding.
 - 2. Section 07 84 00: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Sections Under 09 90 00 Heading: Painting of mechanical items requiring field painting.
 - 4. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut, Wayne, MI www.tyco-unistrut.com.
- B. Materials:
 - 1. Hangers, Rods, And Inserts
 - a. Galvanized and UL approved for service intended.
 - b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
 - 1) Support insulated pipes **2 inches 50 mm** in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
 - a) Type Two Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.
 - (2) Insulation Protection Shield: Anvil Fig. 167.
 - (3) Equals by Cooper B-Line.
 - 2) Support insulated pipes **2-1/2 inches 63 mm** in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
 - a) Type Two Acceptable Products:
 - (1) Clevis Hanger: Anvil Fig. 260.
 - (2) Roller Assembly: Anvil Fig. 171.

(3) Insulation Protection Shield: Anvil Fig. 167.

(4) Equals by Cooper B-Line.

3) Support uninsulated copper pipe **2 inches** **50 mm** in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.

a) Type Two Acceptable Products:

- (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
- (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
- (3) Equals by Cooper B-Line.

4) Support uninsulated copper pipe **2-1/2 inches** **63 mm** in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.

a) Type Two Acceptable Products:

- (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
- (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
- (3) Equals by Cooper B-Line.

c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size	Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller	10 mm	50 mm and smaller
1/2 inch	2-1/2 to 3-1/2 inches	13 mm	63 mm to 88 mm
5/8 inch	4 to 5 inches	16 mm	100 mm to 125 mm
3/4 inch	6 inches	19 mm	150 mm
7/8 inch	8 to 12 inches	22 mm	200 mm to 300 mm

d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	50mm	63mm	75mm	100mm	125mm	150mm	200mm
2	10 mm	Two	0	0	0	0	0	0
2	13 mm	Three	Three	Two	0	0	0	0
2	16 mm	Six	Four	Three	Two	0	0	0
2	19 mm	Nine	Seven	Five	Three	Two	Two	0
2	22 mm	Twelve	Nine	Seven	Five	Three	Two	Two

1) Size trapeze angles so bending stress is less than **10,000 psi** **69 Mpa**.

e. Riser Clamps For Vertical Piping:

1) Type Two Acceptable Products:

- a) Anvil Fig. 261.
- b) Equals by Cooper B-Line.

f. Concrete Inserts:

1) Individual Inserts:

- a) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
- b) Type Two Acceptable Products:
 - (1) Anvil Fig. 282.
 - (2) Equals by Cooper B-Line.

2) Continuous Inserts:

a) Class Two Quality Standard: Equal to Unistrut P-3200 series.

g. Steel Deck Bracket:

1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch length.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work:
 - 1. Furnish inserts for attaching hangers that are to be cast in concrete floor construction to Division 03 at time floors are poured.
- B. Piping:
 - 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - b. Supports For Horizontal Piping:
 - 1) Support metal piping at **96 inches 2 400 mm** on center maximum for pipe **1-1/4 inches 31 mm** or larger and **72 inches 1 800 mm** on center maximum for pipe **1-1/8 inch 28 mm** or less.
 - 2) Support thermoplastic pipe at **48 inches 1 200 mm** on center maximum.
 - 3) Support PEX pipe at 32 inches minimum on center.
 - 4) Provide support at each elbow. Install additional support as required.
 - c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
 - d. Install supports from inserts cast into concrete floor system, including concrete joists and floor slabs. Where inserts cannot be used, provide expansion shields and support hangers from angles held in place by expansion bolts, never directly from expansion bolt itself. Provide calculations necessary to determine number of expansion bolts required to equal capacity of cast-in-place insert.
 - e. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
 - f. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.

END OF SECTION

SECTION 22 05 53**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
 - 1. Identify all installed mechanical distribution piping, mechanical equipment and components.
 - 2. Cast-in-place concrete.
- C. Related Sections:
 - 1. Division 01 Section "General Requirements."
 - 2. Division 01 Section "Special Procedures."
 - 3. Division 09 Section "Painting" for identification painting.

1.2 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
 - 4. Refer to Division 22 Section "Common Results for Plumbing" for codes and standards, and other general requirements.
- B. ASME –American Society of Mechanical Engineers:
 - 1. ASME A 13.1 Scheme for the identification of piping systems

1.3 SUBMITTALS

- A. Submit under provisions of Division 22 Section "Common Results for Plumbing, Review of Materials" and Division 01 Section "General Requirements."
- B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Submit valve database as per Part 3.05 -Stenciling and Identification, D.3 - Valve Tags.

E.

PART 2 - PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- A. W. H. Brady or Westline products.
- B. No substitutions.

2.2 MATERIALS

- A. Color coding: ASME A13.1 unless specified otherwise.
- B. Plastic nameplates: laminated two-layer plastic with engraved black letters on light, contrasting background color.
- C. Plastic tags: laminated three-layer (double-sided) plastic with engraved black letters on light, contrasting background color. Tag size at least 1-1/2 inch (38 mm) diameter.
- D. Stencils: with clean-cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	Color Field Length	Letter Height
3/4 to 1-1/4 inches (9.5 to 31.7 mm)	8 inches (200 mm)	1/2 inch (13 mm)
1-1/2 to 2 inches (38.1 to 50.8 mm)	8 inches (200 mm)	3/4 inch (20 mm)
2-1/2 to 2 inches (63.5 to 50.8 mm)	12 inches (300 mm)	1 1/4 inch (32 mm)
8 to 10 inches (203.2 to 254 mm)	24 inches (600 mm)	2 1/2 inch (64 mm)
Over 10 inches (254 mm)	32 inches (800 mm)	3 inches (75 mm)
Ductwork and equipment	---	2 1/2 inch (64 mm)

- E. Stencil paint: semi-gloss enamel; in accordance with Division 09 Section "Painting".
- F. Plastic pipe markers: factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
 - 1. Special gases shall be identified using markers with yellow background and black letters, direction arrow, and full chemical names and symbols.
- G. Plastic-tape pipe markers: flexible, vinyl-film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive of identification materials.

B. Prepare surfaces in accordance with Division 09 Section "Painting" for stencil painting.

3.2 INSTALLATION

- A. Plastic nameplates: install with corrosion-resistant mechanical fasteners, or adhesive.
- B. Plastic tags: install with corrosion-resistant chain.
- C. Stencil painting: apply in accordance with Division 09 Section "Painting".
- D. Plastic pipe markers: install in accordance with manufacturer's instructions.
- E. Plastic-tape pipe markers: install completely around pipe in accordance with manufacturer's instructions.
- F. Underground plastic pipe markers: install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

3.3 IDENTIFICATION SCHEDULE

- A. Equipment: identify air-handling units, pumps, heat-transfer equipment, tanks, and water-treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags.
- B. Controls: identify control panels and major control components outside of panels with plastic nameplates.
- C. Valves: identify valves in main and branch piping with tags.
- D. Piping: identify piping, concealed or exposed, with stenciled painting. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not more than 20 feet (6 m) apart on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- E. Ductwork: identify ductwork with stenciled painting. Identify as to air-handling unit number, and area served. Locate identification at air-handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

3.4 VALVE DATABASE

- A. Provide specified valve database.

3.5 STENCILING AND IDENTIFICATION

- A. Stencil each piece of new and existing equipment including pumps, fans, tanks, etc., with the equipment tags scheduled on the drawings. Use minimum 2 inches (50 mm) high characters.
 1. Stencil each duct leaving the mechanical room indicating fan unit, area(s), direction of flow, or room(s) served.
 2. Stencil each duct branch leaving an air shaft at each floor with fan number, and identify it as a supply, exhaust, or return duct, and indicate direction of air flow.
- B. Post a framed and typewritten schedule of all stencils, pipe markers, valve tags, and lubricants used, with identification, shall be framed and posted in the mechanical equipment room.

- C. Identify all pipes with specified markers.
 - 1. Install markers every 10 feet (3 m) on mains, at all branch take-offs and adjacent to valves and cocks.
 - 2. Apply to all exposed pipes, pipes behind removable tile ceiling, pipes in concealed but accessible locations, such as behind access panels and at least once in each room.
 - 3. Install pipe marker using pressure sensitive adhesive in accordance with the manufacturer's directions. The marker shall completely cover the circumference of the pipe and overlap itself.
- D. Valve Tags: Provide numbered tags for main valves, branch valves, zone valves, shut-off valves, and balancing valves installed under this Contract, constructed of #18 gauge (1.02 mm) brass, circular, 1 1/4 inches (31.7 mm) in diameter, and with numbers cut in and blackened so as to be plainly discernible. Fasten tags to valve with brass links.
 - 1. Valve numbers not required for valves obviously serving equipment such as air handler coils, reheat coil valves, and miscellaneous drains.
 - 2. On the as-built drawings, indicate the location and number of each tagged valve.
 - 3. Provide a computer file database in a form agreeable to the University, describing the valve, number, location, type of service normally "open" or "closed", specific duty of each tagged valve, and manufacturer and model number.
- E. Warning Sign at Fume Exhaust Plenums: Place warning sign on each fume exhaust plenum access - "WARNING. HAZARDOUS ATMOSPHERE INSIDE. USE BREATHING APPARATUS" when breaching containment.
- F. Place warning signs on all machines driven by electric motors which are controlled by fully automatic starters. See Section 3320, Article 7, Subchapter 7, General Industry Safety Orders, Title 8, California Code of Regulations.
- G. Fire dampers and fire smoke dampers: at each fire damper or fire smoke damper access panel, label "FIRE DAMPER" or "FIRE SMOKE DAMPER" in minimum 2 inches (25 mm) high letters. Fire smoke dampers shall be provided with tags to identify each fire smoke dampers as "FSD-NUMBER SEQUENCES-BLDG NUMBER". Provide chart to University for approval.
- H. Wherever charts, Shop Drawings, etc. Refer to specific room numbers, use room numbers that will be provided by the university rather than the room numbers indicated on the Drawings.

END OF SECTION

SECTION 22 07 16**PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
2. Furnish and install insulation on roof drain piping as described in Contract Documents.

B. Related Requirements:

1. Section 22 11 16: Domestic Water Piping.

PART 2 - PRODUCTS**2.1 COMPONENTS**

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. IMCOA, Youngsville, NC www.nomacokflex.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
 - g. Nomaco Inc, Yopungsville, NC www.nomacokflex.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com.
 - i. Speedline Corp, Solon, OH www.speedlinepvc.com.

B. Materials:

1. Above Grade Metal Piping:
 - a. Insulation For Piping:
 - 1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
 - 2) Insulation Thickness:

Service Water Temperature	Pipe Sizes		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In

- 2) Performance Standards: Fiberglas ASJ by Owens-Corning.
- 3) Type One Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.

- e) Johns-Manville.
- f) Equal as approved by Architect before bidding. See Section 01 62 00.
- b. Fitting, Valve, And Accessory Covers:
 - 1) PVC.
 - 2) Performance Standard: Zeston by Johns-Manville.
 - 3) Type One Acceptable Manufacturers:
 - a) Knauf.
 - b) Speedline.
 - c) Johns-Manville.
 - d) Equal as approved by Architect before bidding. See Section 01 62 00.
- 2. Below Grade Metal Piping:
 - a. Insulation:
 - 1) **1/2 inch 13 mm** thick.
 - 2) Category Four Acceptable Products. See Section 01 62 00 for definition of Categories.
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 62 00 for definition of Categories.
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.
- 3. Pex Piping, Above And Below Grade:
 - a. Insulation:
 - 1) **1/2 inch 13 mm** thick.
 - 2) Category Four Acceptable Products. See Section 01 62 00 for definition of Categories.
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories.
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Above Grade Piping:
 - 1. Apply insulation to clean, dry piping with joints tightly butted.
 - 2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
 - 3. Piping up to **1-1/4 Inch 31 mm** Diameter: Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive. Adhere **3 inch 75 mm** wide self-sealing butt joint strips over end joints.
 - 4. Piping **1-1/2 Inch 39 mm** Diameter And Larger:
 - a. Use broken-joint construction in application of two-layer covering.
 - b. Fill cracks and depressions with insulating cement mixed to thick plastic paste. Apply by hand in several layers to make up total specified thickness. Final layer shall have smooth uniform finish before application of covering.
 - c. Apply PVC jacket.
 - 5. Fittings, Valves, And Accessories:
 - a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
 - b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
 - c. Piping Up To **1-1/4 Inch 31 mm** Diameter: Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.

- 1) Alternate Method: Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two **1/8 inch 3 mm** wet coats of vapor barrier mastic reinforced with glass fabric extending **2 inches 50 mm** onto adjacent insulation.
- d. Piping **1-1/2 inches 38 mm** To **2 Inches 50 mm**: Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation. Apply final coat of fitting mastic over insulating cement.
- e. Piping **2-1/2 inches 63 mm** And Larger: Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement. Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
6. Pipe Hangers:
 - a. Do not allow pipes to come in contact with hangers.
 - b. Provide **16 ga 1.6 mm** by **6 inch 150 mm** long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

B. Below Grade Piping: Slip underground pipe insulation onto pipe and seal butt joints. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

SECTION 22 11 16**DOMESTIC WATER PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Perform excavating and backfilling required by work of this Section.
 - 2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines **5 feet 1 500 mm** from building perimeter as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 05 01: Common Piping Requirements.
 - 2. Section 22 07 16: Plumbing Piping Insulation.
 - 3. Section 31 23 16: Criteria for performance of excavation.
 - 4. Section 31 23 23: Criteria for performance of backfill.
 - 5. Section 33 11 16: Domestic water piping from **5 feet 1 500 mm** from building perimeter to main.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Manufacturer's literature on PEX pipe and PEX pipe fittings.
 - 2. Sample: PEX pipe fitting.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports: Written report of sterilization test.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armstrong International Inc, Three Rivers, MI www.armstrong-intl.com.
 - b. Bell & Gossett, Morton Grove, IL www.bellgossett.com.
 - c. Cash Acme, Cullman, AL www.cashacme.com
 - d. Cla-Val Company, Costa Mesa, CA www.cla-val.com.
 - e. Conbraco Industries Inc, Matthews, NC www.conbraco.com.
 - f. Hammond Valve, New Berlin, WI www.hammondvalve.com.
 - g. Handy & Harmon Products Div, Fairfield, CT www.handyharmon.com.
 - h. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - i. Jenkins Valves Inc, Brantford, ON www.cranevalve.com.
 - j. Leonard Valve Co, Cranston, RI www.leonardvalve.com.
 - k. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.

- I. Mueller Co, Decatur, IL www.muellerflo.com.
- m. Nibco Inc, Elkhart, IN www.nibco.com.
- n. PowersControls, Buffalo Grove, IL www.powerscontrols.com.
- o. Rehau, Leesburg, VA www.rehau-na.com.
- p. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
- q. Spence Engineering Co, Walden, NY www.spenceengineering.com.
- r. Stockham Valves, Cullman, AL www.stockham.com.
- s. Symmons Industries, Braintree, MA www.symmons.com.
- t. Taco Inc, Cranston, RI or Mississauga, ON www.taco-hvac.com.
- u. Uponor Inc, Apple Valley, MN www.uponor-usa.com.
- v. Viega ProPress, Wichita, KS www.viega-na.com.
- w. Watts Regulator Co, Andover, MA www.wattsreg.com.
- x. Wilkins Operation, Paso Robles, CA www.zurn.com.

B. Materials

- 1. Pipe:
 - a. Copper:
 - 1) Above-Grade: Meet requirements of ASTM B 88, Type L.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM B 88, Type K. **3/4 inch 19 mm** minimum under slabs.
 - b) **2 inches 50 mm** And Smaller: Annealed soft drawn.
 - c) **2-1/2 inches 63 mm** And Larger: Hard Drawn.
 - b. Cross-Linked Polyethylene (PEX):
 - 1) Certified with NSF International against NSF Standards 14 and 61 and NSF Protocol 171.
 - 2) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
 - 3) Pressure rated for 160 psi at 73 deg F, 100 psi at 180 deg F, and 80 psi at 200 deg F.
 - 4) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.
 - 5) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).
 - 6) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Raupex by Rehau.
 - b) Wirsbo Aquapex by Uponor.
 - c) ViegaPEX by Viega.
- 2. Fittings:
 - a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Everloc by Rehau.
 - b) Propex by Uponor including EP flow-through multiport tees.
 - c) F877 bronze fitting with stainless steel press sleeve by Viega.
- 3. Connections For Copper Pipe:
 - a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
- 4. Ball Valves:

- a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
- b. Valves shall be two-piece, full port for 150 PSI SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off. Full port, three-piece maintenance design.
 - 2) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
 - 3) Seat: Bubble tight at 100 psig under water.
- c. Class One Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
- 5. Combination Pressure Reducing Valve / Strainer:
 - a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
 - b. Built-in thermal expansion bypass check valve.
 - c. Class One Quality Standard: Watts U5B.
 - 1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.
- 6. Mixing Valve MV-1:
 - a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of 11 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1017-2003.
 - d. Set for 110 deg F 43 deg C Service.
 - e. Class One Quality Standard: Powers LM492-10. See Section 01 6200.
 - f. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.
- 7. Mixing Valve MV-2:
 - a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of 5.7 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1016 and 1070.
 - d. Set for 110 deg F 43 deg C Service.
 - e. Class One Quality Standard: Powers LM495. See Section 01 6200.
 - f. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Below Grade:
 - 1. Install piping under slabs without joints where possible.
 - 2. Insulate water piping buried within building perimeter.
 - 3. Bury water piping 6 inches 150 mm minimum below bottom of slab and encase in 2 inches 50 mm minimum of sand.
- B. Locate cold water lines a minimum of 6 inches 150 mm from hot water line.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Before pipes are covered, test systems in presence of Architect at 125 psi 862 kPa hydrostatic pressure for 4 hours and show no leaks. Disconnect equipment not suitable for 125 psig 862 kPa pressure from piping system during test period.

3.3 CLEANING

- A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
- B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

SECTION 22 11 19**DOMESTIC WATER PIPING SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous potable water piping specialties as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 05 01: Common Plumbing Requirements.

PART 2 - PRODUCTS**2.1 ACCESSORY PRODUCTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Ashcroft, Stratford, CT www.ashcroftinc.com.
 - b. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
 - c. H O Trerice, Oak Park, MI www.hotco.com.
 - d. Josam Co, Michigan City, IN www.josam.com.
 - e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - f. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - g. Nibco Inc, Elkhart, IN www.nibco.com.
 - h. Precision Plumbing Products, Portland, OR www.pppinc.net.
 - i. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - j. Tubular Brass Plumbing Products by Zurn, Sanford, NC www.zurn.com.
 - k. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - l. Watts Drainage, Spindale, NC www.watts.com.
 - m. Zurn Cast Metal, Erie, PA www.zurn.com.
- B. Materials:
 - 1. Exterior Hydrants:
 - a. Provide with integral anti-siphon device. Key-operated.
 - b. Non-freeze.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Josam: 71050.
 - 2) J. R. Smith: 5609-QT.
 - 3) Wade: W-8600.
 - 4) Zurn: Z-1310.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Gauges: Connect to pipe with **1/4 inch 6 mm** connections utilizing gauge cocks.

END OF SECTION

SECTION 22 13 16**FACILITY SANITARY SEWERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines **5 feet 1 500 mm** out from building where applicable.
 - 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
 - 1. Sections Under 07 3000 Heading: Furnishing and installing of roof jacks and pipe flashing at roof.
 - 2. Section 07 84 00: Quality of firestopping material.
 - 3. Section 22 05 01: Common Plumbing Requirements.
 - 4. Section 31 23 16: Criteria for performance of excavation.
 - 5. Section 31 23 23: Criteria for performance of backfill.
 - 6. Section 33 33 13: Sewage piping from **5 feet 1 500 mm** out from building to main.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

1.3 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A 74-05, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
 - b. ASTM C 564-03a, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
 - c. ASTM D 2235-94, 'Standard Specification for Solvent Cement for ABS Plastic Pipe and Fittings.'
 - d. ASTM D 2321-05, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
 - e. ASTM D 2564-02, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride)(PVC) Plastic Piping Systems.'
 - f. ASTM D 3034-04a, 'Standard Specification for Type PSM Poly Vinyl Chloride)(PVC) Sewer Pipe and Fittings.'
 - g. ASTM F 628-01, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings with a Cellular Core.'
 - h. ASTM F 656-02, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings.'
 - i. ASTM F 891-04, 'Standard Specification for Coextruded Poly (Vinyl Chloride)(PVC) Plastic Pipe with a Cellular Core.'

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:

1. Manufacturer Contact List:

- a. American Brass & Iron (AB&I), Oakland, CA www.abifoundry.com.
- b. Clamp-All Corp, Haverhill, MA www.clampall.com.
- c. Anaco-Husky, Corona, CA www.anaco-husky.com.
- d. Josam Co, Michigan City, IN www.josam.com.
- e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
- f. MG Piping Products Co, Stanton, CA www.mgcoupling.com.
- g. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
- h. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
- i. Zurn Cast Metal, Erie, PA, CT www.zurn.com.

B. Performance:

1. Design Criteria:

- a. Minimum size of waste piping installed under floor slab on grade shall be **2 inches 50 mm**.

C. Materials:

- 1. Piping And Fittings: PVC Schedule 40 cellular core plastic pipe and pipe fittings meeting requirements of ASTM F 891, joined using cement primer meeting requirements of ASTM F 656 and pipe cement meeting requirements of ASTM D 2564.
- 2. Buried Piping:
 - a. Approved Types: Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A 74.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C 564.
 - 2) No-Hub:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - b) SuperGrip 304 American Brass & Iron (AB&I).
 - c) Husky SD 4000 coupling by Anaco.
 - d) Neoprene gaskets with type 304 stainless steel clamp and 24 ga type 304 stainless steel housing by Clamp-All Corp.
 - e) MG Coupling by MG Piping Products.
- 3. Above Grade Piping And Vent Lines:
 - a. Approved Types:
 - 1) Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A 74.
 - 2) Vent lines **2-1/2 inches 63 mm** or smaller may be Schedule 40 galvanized steel.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C 564.
 - 2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.
- 4. Fittings:
 - a. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A 74.
 - 1) Joint Material: Rubber gaskets meeting requirements of ASTM C 564.
 - 2) Galvanized Pipe: Screwed Durham tarred drainage type.
 - b. Traps installed on cast iron bell and spigot pipe shall be service weight cast iron. Traps installed on threaded pipe shall be recess drainage pattern type.
 - c. P-Traps:
 - 1) Trap shall have clean out plug if installed in other than slab on grade.
 - 2) Type Two Acceptable Products:
 - a) 7220 deep seal cast iron by JR Smith
 - b) Zurn Z-1000 by Zurn Industries.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
- 5. Cleanouts:
 - a. Furnish wall cleanouts with chrome wall cover and screw.
 - b. Type Two Acceptable Products:
 - 1) Finish Floors:
 - a) Josam: 56010.
 - b) J. R. Smith: 4023.
 - c) Mifab: C1100C-R-1.

- d) Wade: W-6000.
- e) Zurn: Z-1402.
- 2) Resilient Flooring:
 - a) Josam: 56010-12.
 - b) J. R. Smith: 4140.
 - c) Mifab: C1100C-T-1.
 - d) Wade: W-6000-T.
 - e) Zurn: Z-1400.
- 3) Finished Wall:
 - a) Josam: 58790.
 - b) J. R. Smith: 4530.
 - c) Mifab: C1460RD.
 - d) Wade: W8560E.
 - e) Zurn: Z-1446.
- 4) Exposed Drain Lines:
 - a) Josam: 58910.
 - b) J. R. Smith: 4510.
 - c) Mifab: C1460.
 - d) Wade: W8560B.
 - e) Zurn: Z-1440.
- 5) General Purpose:
 - a) Josam: 58900.
 - b) J. R. Smith: 4400.
 - c) Mifab: C1300-MF
 - d) Wade: W8550E.
 - e) Zurn: Z-1440.
- 6) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
 - 1. Runs shall be as close as possible to those shown on Drawings.
 - 2. Excavate to required depth and grade to obtain fall required. Grade soil and waste lines within building perimeter **1/4 inch 6 mm** fall in **one foot 300 mm** in direction of flow.
 - 3. Bottom of trenches shall be hard. Tamp as required.
 - 4. Remove debris from trench before laying of pipe.
 - 5. Do not cut trenches near footings without consulting Architect.
- B. Thermoplastic Pipe And Fittings:
 - 1. General: Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
 - 2. Above Grade: Locate pipe hangers every **4 feet 1 200 mm** on center maximum and at elbows.
 - 3. Below Grade:
 - a. Install in accordance with Manufacturer's recommendations and ASTM D 2321.
 - b. Stabilize unstable trench bottoms.
 - c. Bed pipe true to line and grade with continuous support from firm base.
 - 1) Bedding depth: **4 to 6 inches 100 to 150 mm**.
 - 2) Material and compaction to meet ASTM standard noted above.
 - d. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
 - e. Trench width at top of pipe:
 - 1) Minimum: **18 inches 450 mm** or diameter of pipe plus **12 inches 300 mm**, whichever is greater.
 - 2) Maximum: Outside diameter of pipe plus **24 inches 600 mm**.
 - f. Do not use backhoe or power equipment to assemble pipe.

- g. Initial backfill shall be **12 inches 300 mm** above top of pipe with material specified in referenced ASTM standard.
- h. Minimum cover over top of pipe not under building slab:
 - 1) **36 inches 900 mm** before wheel loading.
 - 2) **48 inches 1 200 mm** before compaction.
- C. Install piping so cleanouts may be installed as follows:
 - 1. Where shown on Drawings and near bottom of each stack and riser.
 - 2. At every 135 degrees of accumulative change in direction for horizontal lines.
 - 3. Every **100 feet 30 meters** of horizontal run.
 - 4. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.
- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or siphon condition on water seal.
- E. Vent entire waste system to atmosphere. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Vent line terminations shall be:
 - 1. **6 inches 150 mm** minimum above roof and **12 inches 300 mm** minimum from any vertical surface.
 - 2. Same size as vent pipe.
 - 3. In areas where minimum design temperature is below **0 deg F minus 18 deg C** or where frost or snow closure may be possible:
 - a. Vent line terminations shall be same size as vent pipe, except no smaller than **2 inches 50 mm** in diameter.
 - b. Vents shall terminate **10 inches 250 mm** minimum above roof or higher if required by local codes.
- F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Conduct tests for leaks and defective work. Notify Architect before testing.
 - 2. Thermoplastic Pipe System:
 - a. Before backfilling and compacting of trenches, cap all open ends and pressure test to 6 psi for 2 hours with no leaks. Correct leaks and defective work.
 - b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

SECTION 22 13 19**FACILITY SANITARY SEWER SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous sanitary sewer specialties as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 05 01: Common Plumbing Requirements.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. H-M Company, Cincinnati, OH www.draintroughs.com.
 - b. Josam Co, Michigan City, IN www.josam.com.
 - c. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - d. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - e. Scherpings Systems, Winstead, MN www.scherpingsystems.com.
 - f. Sioux Chief Manufacturing Co, Peculiar, MO www.siouxchief.com.
 - g. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - h. Watts Drainage, Spindale, NC www.watts.com.
 - i. Zurn Cast Metal, Erie, PA www.zurn.com.
- B. Components:
 - 1. Drains And Drain Accessories:
 - a. Floor Drain FD-1:
 - 1) Approved types with deep seal trap and chrome plated strainer.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Josam: 30000-50-Z-5A with 88250 trap.
 - b) J. R. Smith: 2010-A with 7222 trap.
 - c) Wade: 1100 with 2450-T trap.
 - d) Zurn: Z-415 with Z 1000 trap.
 - b. Floor Drain FD-2:
 - 1) Approved types with shallow trap, chrome plated 5 inch 125 mm diameter strainer, and 2-1/2 to 4 inch 63 to 100 mm diameter by 4-1/4 inch 106 mm high chrome plated funnel.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Josam: 30000-50-Z-E2-CP.
 - b) J. R. Smith: 3520-F11-CP.
 - c) Zurn: Z-450.
 - c. Floor Drain FD-4:
 - 1) Approved types with deep seal trap and chrome plated strainer, and 2-1/2 to 4 inch 63 to 100 mm diameter by 4-1/4 inch 106 mm high chrome plated funnel.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Josam: 30000-50-Z-5A-CP with 88252 trap.
 - b) J. R. Smith: 3510-F11-CP with 7222 trap.
 - c) Wade: 1100 with 2450-T trap.
 - d) Zurn: 415 with Z 1000 trap.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 22 33 30**ELECTRIC DOMESTIC WATER HEATERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install electric water heater as specified in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 05 01: Common Plumbing Requirements.
 - 2. Section 22 11 16: Domestic Water Piping.

1.2 WARRANTY

- A. Three-year non-prorated warranty on water heaters of **20 gallon 76 liters** capacity and larger.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Water Heater Co, Johnson City, TN www.americanwaterheater.com.
 - b. A O Smith Water Products Co, Ashland City, TN www.hotwater.com.
 - c. Bradford-White Corp, Ambler, PA www.bradfordwhite.com.
 - d. Controlled Energy Corp, Waitsfield, VT www.cechot.com.
 - e. In-Sink-Erator, Racine, WI www.insinkerator.com.
 - f. Rheem / Ruud Water Heater Div Rheem Manufacturing, Atlanta, GA www.rheem.com.
 - g. State Industries Inc, Ashland City, TN www.stateind.com.
- B. Materials:
 - 1. **100 Gallon 378.5 Liter**:
 - a. Glass lined storage tank pressure tested and rated for 125-psi working pressure.
 - b. Water heaters shall each have ASME rated temperature-pressure relief valve rated at MBH input of heater minimum set to relieve at 120 psi.
 - c. **3 inches 75 mm** minimum glass fiber or polyurethane foam insulation.
 - d. Complete with three-stage thermostat with step control, magnesium anode, electric sheath rod type heating elements, and high limit control.
 - e. Heater shall be pre-wired and entire unit bear UL label.
 - f. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) American: ASTCE-33-119.
 - 2) A O Smith: DSE 100.
 - 3) Bradford White: M-II-120A-KW-3SF
 - 4) Ruud: AGLS 120.
 - 2. **40 Gallon 152 Liter**, Regular Height:
 - a. Glass lined storage tank pressure tested and rated for 125-psi working pressure.
 - b. Water heaters shall each have ASME rated temperature-pressure relief valve rated at MBH input of heater minimum set to relieve at 120 psi.
 - c. 9 Kw.
 - d. **3 inches 75 mm** minimum glass fiber or polyurethane foam insulation.

- e. Complete with two stage thermostat, magnesium anode, electric sheath rod type heating element, and high limit control.
- f. Heater shall be pre-wired and entire unit bear UL label.
- g. Maximum Height: **50 inches** **1250 mm**
- h. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) American: STCE-33-50.
 - 2) A O Smith: DSE-40.
 - 3) Bradford White: M-II-50-KW-3SF
 - 4) State Industries: SB6-40.

3. **40 Gallon 151.4 Liter**, Table Top Model:

- a. Glass lined storage tank pressure tested and rated for 125-psi working pressure.
- b. Water heaters shall each have ASME rated temperature-pressure relief valve rated at MBH input of heater minimum set to relieve at 120 psi.
- c. **2 inches** **50 mm** minimum glass fiber insulation.
- d. Complete with two stage thermostat, magnesium anode, electric sheath rod type heating element, and high limit control.
- e. Heater shall be pre-wired and entire unit bear UL label.
- f. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) American: E52-38T-045D.
 - 2) A O Smith: ETTN-40.
 - 3) Bradford White: J-I-40TT6DS
 - 4) Rheem: 88H-40D.
 - 5) Ruud: PET40-2.
 - 6) State: CV40-2STI.

4. **4 Gallon 15 Liter**:

- a. UL listed.
- b. 110-120 V, single phase, 1500 watts maximum heating capacity.
- c. Thermostatic control with adjustable setting.
- d. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - 1) Controlled Energy Corporation: Ariston Model GL-4.

5. **2 / 2.5 Gallon 7.5 / 9.5 Liter**:

- a. UL listed.
- b. 110-120 V, single phase, 1500 watts maximum heating capacity.
- c. Thermostatic control with adjustable setting.
- d. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - 1) American: E1E2.5US013V.
 - 2) Bradford-White: Model MI-2U6-SS.
 - 3) Controlled Energy Corporation: Ariston Model GL-2.5.
 - 4) In-Sink-Erator: Model W-152.
 - 5) Rheem: 81VP2S.

2.2 ACCESSORY PRODUCTS

- A. Anchoring Components:
 - 1. One inch by **18 ga** **25 by 1.3 mm** galvanized steel straps.
 - 2. No. 10 by 2-1/2 inch screws.
- B. Thermal Expansion Absorbers:
 - 1. Bladder type for use with potable water systems.
 - 2. Type One Acceptable Products.
 - a. Therm-X-Trol ST-12 by Amtrol Inc, West Warwick, RI www.amtrol.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.
- B. Anchor **20 gallon** **76 liter** and larger water heaters to wall using anchoring straps and specified screws.

3.2 ADJUSTING

- A. Set discharge water temperature at **140 deg F** **60 deg C**.

END OF SECTION

SECTION 22 42 13**COMMERCIAL WATER CLOSETS AND URINALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 92 13: Sealants used between fixtures and other substrates.
 - 2. Section 22 05 01: Common Mechanical Requirements.
 - 3. Section 22 11 16: Domestic Water Piping.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Plumbing, Piscataway, NJ www.americanstandard-us.com.
 - b. AMTC - Advanced Modern Technologies Corp, Woodland Hills, CA www.amtcorporation.com.
 - c. Bemis Manufacturing Co, Sheboygan Falls, WI www.bemismfg.com.
 - d. Beneke by Sanderson Plumbing Products, Columbus, MS www.sppi.com.
 - e. BrassCraft Manufacturing Co, Novi, MI www.brasscraft.com.
 - f. Briggs Industries Inc, Tampa, FL www.briggsplumbing.com.
 - g. Cambridge Brass, Cambridge, ON www.cambridgebrass.com.
 - h. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
 - i. Church Seat Co, Sheboygan Falls WI www.churchseats.com.
 - j. Delany Flush Valves, Charlottesville, VA www.coynedelany.com.
 - k. Crane Plumbing, Evanston, IL www.craneplumbing.com.
 - l. Dearborn Brass, Cleveland, OH www.dearbornbrass.com.
 - m. Eljer Plumbingware, Dallas, TX www.eljer.com.
 - n. Josam Co, Michigan City, IN www.josam.com.
 - o. Jay R. Smith Mfg. Co, Montgomery, AL www.jrsmith.com.
 - p. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - q. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - r. Olsonite Corp, Newnan, GA www.olsonite.net.
 - s. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - t. South Fork Manufacturing, Coalville, UT (801) 953-3001 www.dirtgrabber.com.
 - u. Toto U.S.A., Inc., Morrow, GA www.totousa.com
 - v. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - w. Zurn Commercial Brass, Sanford, NC www.zurn.com.
 - x. Zurn Cast Metal, Erie, PA www.zurn.com.
- B. Performance:
 - 1. Design Criteria:
 - a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- C. Materials:
 - 1. Water Closets:

- a. General: Maximum water usage of **1.6 gallons 6 liters** per flush.
- b. Standard Fixture:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Madera 2234.015.
 - b) Briggs: Carlton 7714.
 - c) Eljer: Signature III-2125.
- c. Handicap Accessible Fixture:
 - 1) 18 inch maximum rim height.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Madera 3043.102.
 - b) Briggs: Carlton 7790.
 - c) Eljer: Signature 2145.

2. Urinals:

- a. Standard Fixture:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Trimbrook 6561.017.
 - b) Crane: Embassy 7-150.
 - c) Eljer: Savon 161-1090.
 - d) Kohler: Freshman K-4985-T.
- b. Handicap Fixture:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Trimbrook 6561.017.
 - b) Crane: Embassy 7-150.
 - c) Eljer: Savon 161-1090.
 - d) Kohler: Freshman K-4989-T.

3. Water Closet Accessories:

- a. Seats:
 - 1) Provide split front type with check hinge.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Standard And Handicap Accessible Fixtures:
 - b) Bemis: 1655SSC.
 - c) Beneke: 527 SS.
 - d) Church: 9500SSC.
 - e) Kohler: K-4731-C.
 - f) Olsonite: 95SSC.
 - g) Toto SC534.
- b. Supply Pipe And Stop:
 - 1) Provide chrome plated quarter-turn brass ball valve, **12 Inch 25 mm** braided stainless steel riser, and chrome-plated steel flange.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) McGuire: BV2166CC.
 - b) Zurn: Z8804 CRQ-PC.
- c. Flush Valve (Sensor Operated):
 - 1) General: Maximum water usage of **1.6 gallons 6 liters** per flush.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Moen: 8310.
 - b) Sloan: 111SMO with override button.
 - c) Zurn: ZR 6000*AV*WS1.
- d. Flush Valve Filter:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.

4. Urinal Accessories:

- a. Carrier / Support:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Josam.
 - b) Jay R. Smith.
 - c) Wade.
- b. Flush Valve:
 - 1) Low flow, **1 gallons 4 liters** per flush maximum.
 - 2) Proximity sensor type.

- 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Delany: I1451-OB
 - b) Moen: 8312.
 - c) Sloan: 186-SMO with override button.
 - d) Zurn: ZR-6003-AV with maintenance override button.
- c. Automatic Flush Valve Retrofit:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) AMTC: AEF-801 DualFlush.
 - b) Moen: 8312R10
 - c) Sloan 'Smooth' EBV250A
- d. Flush Valve Filter:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.
- e. Automatic Flush Valve Retrofit:
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - a) AMTC: AEF-801 DualFlush.
 - b) Moen 8312R10.
 - c) Sloan 'Smooth' EBV250A
- f. Flush Valve Filter:
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
 1. Seal wall-mounted fixtures around edges to wall with sealant specified in Section 07 9213.
 2. Attach wall-hung fixtures to carriers.
 3. Support fixture hanger or arm free of finished wall.
- C. Adjust flush valves for proper flow.
- D. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- E. Install fixtures with accessible stop or control valve in each branch supply line.
- F. Mounting:
 1. Urinals:
 - a. Standard: 24 inches from floor to bottom lip.
 - b. Handicap Accessible: 17 inches from floor to bottom lip.
- G. Make fixture floor connections with approved brand of cast iron floor flange, soldered or calked securely to waste pipe. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets. Calk between fixtures and floor with sealant specified in Section 07 9213. Point edges.
- H. Flush Valve Filters:
 1. Install in Delany, Sloan, and Zurn flush valves.
 2. Install after water lines have been flushed out, but before turning water into flush valve.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 22 42 16**COMMERCIAL LAVATORIES AND SINKS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 92 13: Sealants used between fixtures and other substrates.
 - 2. Section 22 05 01: Common Mechanical Requirements.
 - 3. Section 22 11 16: Domestic Water Piping.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Standard Plumbing, Piscataway, NJ www.americanstandard.com.
 - b. BrassCraft Manufacturing Co, Novi, MI www.brasscraft.com.
 - c. Brocar Products Inc, Cincinnati, OH www.brocar.com.
 - d. CECO, Huntington Park, CA www.cecinks.com.
 - e. Chicago Faucet Co, Des Plaines, IL www.chicagofaucets.com.
 - f. Dearborn Brass, Tyler, TX www.dearbornbrass.com.
 - g. Delta Faucet Co, Indianapolis, IN www.deltafaucet.com.
 - h. Eljer Plumbingware, Dallas, TX www.eljer.com.
 - i. Elkay Manufacturing Co, Oak Brook, IL www.elkay.com.
 - j. Fiat Products, Evanston, IL www.craneplumbing.com.
 - k. Josam Co, Michigan City, IN www.josam.com.
 - l. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - m. Just Manufacturing Co, Franklin Park, IL www.jstsinks.com.
 - n. Keeney Manufacturing Co, Newington, CT www.keeneymfg.com.
 - o. Kohler Co Plumbing Div, Kohler, WI www.us.kohler.com.
 - p. McGuire Manufacturing Co, Cheshire, CT www.mcguiremfg.com.
 - q. Mifab Manufacturing Inc, Amherst, NY www.mifab.com.
 - r. Moen Incorporated, North Olmsted, OH www.moen.com.
 - s. Omni Flow Controls, Harbor City, CA www.chronomite.com or www.omniflowcontrols.com.
 - t. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - u. Speakman Company, New Castle, DE www.speakmancompany.com.
 - v. Stern-Williams, Shawnee Mission, KS www.sternwilliams.com.
 - w. Symmons, Braintree, MA www.symmons.com.
 - x. T & S Brass & Bronze Works Inc, Travelers Rest, SC www.tsbrass.com.
 - y. TrueBro Inc, Collierville, TN www.truebro.com.
 - z. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - aa. Watts Drainage, Spindale, NC www.wattdrainage.com.
 - bb. Zurn Commercial Brass, Sanford, NC www.zurn.com.
 - cc. Zurn Cast Metal, Erie, PA www.zurn.com.
- B. Performance:
 - 1. Design Criteria:

- a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- C. Components:
 - 1. Lavatories And Fittings:
 - a. Standard Counter Top Lavatories:
 - 1) Size **20 by 17 inches 500 by 425 mm** (maximum).
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Aqualyn 0476.028.
 - b) Eljer: Laura 051-3514.
 - c) Kohler: Pennington K-2196-4N.
 - b. Standard Self Supporting Lavatories:
 - 1) Size: **20 by 18 inches 500 by 450 mm**.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Lucern 0355.012.
 - b) Eljer: Delwyn 051-1634.
 - c) Kohler: Greenwich K-2023.
 - 3) Carrier / Support:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Josam.
 - (2) Jay R. Smith.
 - (3) Wade.
 - c. Handicap Accessible Counter Top Lavatories:
 - 1) Size **20 by 17 inches 500 by 425 mm** maximum.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American Standard: Aqualyn 0476.028.
 - b) Eljer: Laura 051-3514.
 - c) Kohler: Pennington K-2196-4N.
 - d. Handicap Accessible Self Supporting Lavatories:
 - 1) Size: **20 by 27 inches 500 by 650 mm**.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) American-Standard: Wheelchair Lavatory 9141.011.
 - b) Eljer: Wheelchair 051-2964.
 - c) Kohler: Morningside K-12638.
 - 3) Carrier / Support:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Josam.
 - (2) Jay R. Smith.
 - (3) Wade.
 - e. Lavatory Fittings:
 - 1) Faucet and Drain:
 - a) Hard-wired automatic faucet.
 - b) Cast brass spout with chrome finish.
 - c) 4-inch cover plate.
 - d) Mechanical mixing valve.
 - e) Solenoid valve.
 - f) Control module and transformer.
 - g) Hermetically sealed electronics.
 - h) Inlet checks and strainer.
 - i) Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - (1) Moen: 8306 with McGuire 155A grid strainer
 - (2) Speakman: S-8811 with S-3440 grid drain.
 - (3) Symmons: S6080-AC-G with checks and mixing valve.
 - (4) Zurn: Z6913-CWB with grid strainer.
 - f. Double Compartment Sinks:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a) Elkay: LR 3319.
- b) Just: DL-1933-A-GR.
- g. Single Compartment Sinks:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Elkay: LR 1918.
 - b) Just: SL-2017-A-GR.
- h. Single Compartment Sink:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Elkay: LR-2219.
 - b) Just: SL-1921-AG-R.
 - 2) Faucets for Standard Double and Single Compartment Sinks:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) American Standard: Heritage Kitchen Faucet with Lever Handles 7270.342H.
 - (2) Chicago: 1888CP.
 - (3) Delta: 27C2243-S6
 - (4) Kohler: K-7761-K with handles K-16012-5.
 - (5) Moen: 8227.
 - (6) Speakman: SC-5724.
 - (7) Zurn Commercial Brass: Z-831J3.
 - 3) Faucets for Sacrament Preparation Room Sink:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) American Standard: Pantry / Service Sink 7100.241H.
 - (2) Chicago: 350-CP.
 - (3) Delta: 27T643-R4.
 - (4) Kohler: K-7895-C.
 - (5) Moen: 8103
 - (6) Speakman: SC-7112.
 - (7) T & S: 0305-01.
 - (8) Zurn: Z-825B1FC.
 - 4) Supply pipes with stops:
 - a) Provide chrome plated quarter-turn brass ball valve, 12 inch long braided stainless steel riser, and chrome-plated steel flange.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) McGuire: BV2165CC.
 - (2) Zurn: Z8804 LRQ-PC.
 - 5) Flow Control Fitting:
 - a) Provide vandal-proof type in place of aerator. Flow shall be 2.0 gpm.
 - b) Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - (1) Omni A-200 Series by Chronomite Laboratories.
 - 6) Waste For Standard Stainless Steel Sinks:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Elkay: LK-99.
 - (2) Kohler: K8801.
 - (3) McGuire: 151
 - (4) Zurn Z-8740-PC.
 - 7) Waste For Sacrament Preparation Room Sink:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Eljer: 803-0570.
 - (2) Elkay: LKKDT35.
 - (3) Just: JDB-35.
 - (4) Kohler: K8807.
 - (5) McGuire: 152

(6) Zurn Z-8739-PC.

8) Trap:

- 17 ga 1.4 mm tube 'P' trap, chrome plated.
- Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - Dearborn.
 - Keeney Manufacturing.
 - McGuire: MCT150075NCZN.
 - Zurn.

2. Miscellaneous Sinks And Fittings:

- Service Sink:
 - Floor Type, enameled cast iron, 28 inches 700 mm square with vinyl coated rim guard or 24 inches 600 mm square with Stainless Steel rim guard.
 - Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - American Standard: Florwell Cast Iron 7741.000 with rim guard 7745.811
 - CECO: 871
 - Eljer: Custodial 242-0050.
 - Fiat: TSBC-1610.
 - Kohler: Whitby K-6710.
 - Zurn: 5850.
 - Service Sink Fittings:
 - Supply:
 - Mounting height of 42 inches 1 050 mm.
 - Provide 48 inch 1 200 mm hose and clamp unless spout is threaded.
 - Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - American Standard: Service Sink Faucet 8344.112 with threaded spout.
 - Chicago: 897 CP.
 - Delta: 28T9 with 28T911 hose and bracket.
 - Kohler: K-8928.
 - Moen: 8124
 - Speakman: SC-5812.
 - T&S: B-0665-BSTP.
 - Zurn: Z-843M1.
 - Drain and Strainer:
 - Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - American Standard: Grid strainer 7721.038.
 - Eljer: 803-0630.
 - Kohler: K-9146, 3 inch IPS.
 - Trap: Cast iron, PVC, or ABS to match piping.
 - Floor Sink:
 - 8 inch square top, medium receptor cast iron body with flanged receptor, acid resistant coated interior, and acid resistant coated half grate. Aluminum sediment bucket and 2 inch calked regular outlet connection.
 - Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - Jay R. Smith: 3411-12.
 - Josam: 49300-3-Z.
 - Wade: W9112-15-64-1C.
 - Zurn: Z-1910-2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install each fixture with separate vent line. Do not circuit vent.

- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
- C. Seal wall-mounted fixtures around edges to wall and counter top fixtures to countertop with sealant specified in Section 07 9213.
- D. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- E. Install fixtures with accessible stop or control valve in each hot and cold water branch supply line.
- F. Self-Supporting Lavatories: Install using carriers. Support carrier free of finished wall.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 23 05 01
COMMON HVAC REQUIREMENTS

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for HVAC systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Interface with Testing And Balancing Agency.
 - 4. Furnish and install sealants relating to installation of systems installed under this Division.
 - 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
 - 6. Furnish and install sound, vibration, and seismic control elements.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.
- C. Related Requirements:
 - 1. Section 03 30 53: Exterior concrete pads and bases for mechanical equipment.
 - 2. Section 05 05 23: Quality and requirements for welding.
 - 3. Section 07 84 00: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 4. Section 07 92 13: Quality of sealants used at building exterior.
 - 5. Section 07 92 19: Quality of acoustical sealants.
 - 6. Sections Under 09 90 00 Heading: Painting of mechanical items requiring field painting.
 - 7. Section 26 29 13: Magnetic starters and thermal protective devices (heaters) not factory mounted integral part of mechanical equipment.
 - 8. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 9. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 - 10. Sections Under 33 50 00 Heading: Fuel Distribution Utilities.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
 - 2. Shop Drawings:
 - a. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.

- b. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
- c. Drawing of each temperature control panel identifying components in panels and their function.
- d. Other shop drawings required by Division 23 trade Sections.

B. Closeout Submittals:

- 1. Operation And Maintenance Manual Data:
 - a. Modify and add to requirements of Section 01 7000 as follows:
 - 1) At beginning of HVAC section of Operations And Maintenance Manual, provide master index showing items included.
 - 2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and HVAC, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
 - 3) Provide operating instructions to include:
 - a) General description of each HVAC system.
 - b) Step by step procedure to follow in putting each piece of HVAC equipment into operation.
 - c) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
 - 4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - a) List of HVAC equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - b) Manufacturer's maintenance instructions for each piece of HVAC equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - c) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
 - d) Manual for Honeywell T7350 thermostat published by Honeywell.
 - 5) Include copies of approved shop drawings and copies of warranties required in individual Sections of Division 23.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Perform work in accordance with applicable provisions of Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 - 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
- B. Identification:
 - 1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Accept valves on site in shipping containers with labeling in place.
- B. Storage:
 - 1. In addition to requirements specified in Division 01:
 - a. Stored material shall be readily accessible for inspection by Architect until installed.
 - b. Store items subject to moisture damage, such as controls, in dry, heated spaces.

- 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.

C. Handling: Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

1.5 WARRANTY

- A. Guarantee HVAC systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- B. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- C. If HVAC sub-contractor with offices located more than **150 miles 240 km** from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Valves: Valves of same type shall be of same manufacturer.
- C. Pipe And Pipe Fittings: Use domestic made pipe and pipe fittings on Project. Weld-O-Let and Screw-O-Let fittings are acceptable.
- D. Sleeves:
 1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or **14 ga 2 mm** galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Drawings:
 1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:

1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
3. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
4. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

3.2 PREPARATION

A. Changes Due To Equipment Selection:

1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.3 INSTALLATION

A. Interface With Other Work:

1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
3. Testing And Balancing:
 - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
 - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:

1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
4. Determine exact route and location of each pipe and duct before fabrication.
 - a. Right-Of-Way:

- 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
- 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
- b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.

D. Piping:

1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - 1) Arrange so as to facilitate removal of tube bundles.
 - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - a) Make connections of dissimilar metals with di-electric unions.
 - b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
 - 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
 - 5) Install piping to insure noiseless circulation.
 - 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 - c. Do not install piping in shear walls.
 2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every **30 feet 9 meters** of straight run.
 - 2) Provide **12 inch 300 mm** offset below roof line in each vent line penetrating roof.
 3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend **1/4 inch 6 mm** above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
 4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
 5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
 - 1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
 - 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.4 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 - 1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 - 2. Surface finishes shall exactly match existing finishes of same materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
 - 2. Replace material or workmanship proven defective with sound material at no additional cost to Owner. Repeat tests on new material, if requested.

3.6 SYSTEM START-UP

- A. Off-Season Start-up:
 - 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
 - 2. Notify Owner seven days minimum before scheduled start-up.
 - 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
 - 4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
 - 1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
 - 2. Make adjustments to insure that:
 - a. Equipment alignments and clearances are adjusted to allowable tolerances.
 - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
 - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
 - d. Miscellaneous alignments, tightenings, and adjustings are completed so systems are tight and free from leakage and equipment performs as intended.
 - 3. Motors and accessories are completely operable.
 - 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
 - 5. Adjust drives for proper alignment and tension.
 - 6. Make certain filters in equipment for moving air are new and of specified type.
 - 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

3.7 CLEANING

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.
- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

3.8 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 - 1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
 - a. Minimum Instruction Periods:
 - 1) HVAC: Eight hours.
 - 2) Temperature Control: Six hours.
 - b. Minimum Instruction Periods:
 - 1) HVAC and Refrigeration: Four hours.
 - 2) Temperature Control: Four hours.
 - c. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 23 05 29**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for HVAC systems.
- B. Related Requirements:
 - 1. Section 05 05 23: Quality and requirements for welding.
 - 2. Section 07 84 00: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Sections Under 09 90 00 Heading: Painting of mechanical items requiring field painting.
 - 4. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Class Two Quality Standard Approved Manufacturers. See Section 01 6200:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.cooperbline.com.
 - c. Erico International, Solon, OH www.erico.com.
 - d. Hilti Inc, Tulsa, OK www.hilti.com.
 - e. Minerallac, Hampshire, IL www.minerallac.com.
 - f. Thomas & Betts, Memphis, TN www.superstrut.com.
 - g. Unistrut, Wayne, MI www.unistrut.com.
- B. Performance:
 - 1. Design Criteria:
 - a. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size	Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller	10 mm	50 mm and smaller
1/2 inch	2-1/2 to 3-1/2 inches	13 mm	63 mm to 88 mm
5/8 inch	4 to 5 inches	16 mm	100 mm to 125 mm
3/4 inch	6 inches	19 mm	150 mm
7/8 inch	8 to 12 inches	22 mm	200 mm to 300 mm

- b. Support rods for multiple pipes supported on steel angle trapeze hangers shall be in accordance with following table:

No.	Diameter	Number of Pipes per Hanger for Each Pipe Size							
		2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch	
2	3/8 Inch	Two	0	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0	0

2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

Rods		Number of Pipes per Hanger for Each Pipe Size						
No.	Diameter	50mm	63mm	75mm	100mm	125mm	150mm	200mm
2	10 mm	Two	0	0	0	0	0	0
2	13 mm	Three	Three	Two	0	0	0	0
2	16 mm	Six	Four	Three	Two	0	0	0
2	19 mm	Nine	Seven	Five	Three	Two	Two	0
2	22 mm	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than 10,000 psi 69 Mpa.

C. Materials:

1. Hangers, Rods, Channels, Attachments, And Inserts
 - a. Galvanized and UL approved for service intended.
 - b. Support horizontal piping from clevis hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
 - c. Class Two Quality Standards:
 - 1) Support insulated pipes with clevis hanger equal to Anvil Fig 260 or roller assembly equal to Anvil Fig 171 with an insulation protection shield equal to Anvil Fig 167. Gauge and length of shield shall be in accordance with Anvil design data.
 - 2) Except uninsulated copper pipes, support uninsulated pipes from clevis hanger equal to Anvil Fig 260. Support uninsulated copper pipe from hanger equal to Anvil Fig CT-65 copper plated hangers and otherwise fully suitable for use with copper tubing.
 - d. Riser Clamps For Vertical Piping:
 - 1) Class Two Quality Standard: Anvil Figure 261.
 - e. Steel Deck Bracket:
 - 1) 6 inch length minimum.
 - 2) Class One Quality Standard: Unistrut P1000 with clamp nut.
 - 3) Acceptable Manufacturers: Hilti, Thomas & Betts
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
 - f. Furnace / Fan Coil Support Channel:
 - 1) Class One Quality Standard: Unistrut P1000.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - g. Swivel Attachment:
 - 1) Class One Quality Standard: Unistrut EM3127.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

EXECUTION

2.2 INSTALLATION

- A. Interface With Other Work:
 1. Furnish inserts for attaching hangers that are to be cast in concrete floor construction to Division 03 at time floors are poured.
- B. Piping:
 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using support channels and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - b. Supports For Horizontal Piping:

- 1) Support metal piping at **96 inches 2 400 mm** on center maximum for pipe **1-1/4 inches 31 mm** or larger and **72 inches 1 800 mm** on center maximum for pipe **1-1/8 inch 28 mm** or less.
- 2) Support thermoplastic pipe at **48 inches 1 200 mm** on center maximum.
- 3) Provide support at each elbow. Install additional support as required.
- c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
- d. Attach support channel to structural steel roof supporting structure. Spacing and support as described above.
- e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
- f. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every **30 feet 9 meters** of straight run.
 - 2) Provide **12 inch 300 mm** offset below roof line in each vent line penetrating roof.

END OF SECTION

SECTION 23 05 48**VIBRATION AND SEISMIC CONTROL FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of and requirements for anchorage and seismic restraint systems and vibration isolation systems for HVAC piping and equipment.
- B. Related Requirements:
 - 1. Section 03 3111: Cast-In-Place Concrete.
 - 2. Furnishing and installing of seismic restraint and vibration isolation systems is by installer of equipment requiring such systems. Manufacturers of equipment specified for seismic restraint shall provide product data needed for calculation of seismic restraint needs. This information shall include, but not be limited to, equipment dimensions, dimensioned anchor points, operating weight, and center of gravity dimension.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A 615-05a, 'Standard Specification for Deformed & Plain Carbon Steel Bars for Concrete Reinforcement.'
 - 2. Sheet Metal & Air Conditioning Contractors National Association / American National Standards Institute:
 - a. SMACNA / ANSI 001-2000, 'Seismic Restraint Manual: Guidelines For Mechanical Systems.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Restraint system and anchorage method to be used for each piece of equipment.
 - b. Seismic restraints and calculations for all flexible mounted equipment.
 - c. Vibration isolators and flexible couplings.
 - d. Clearly outlined procedures for installing and adjusting isolators, seismic bracing anchors, and snubbers.
 - 2. Shop Drawings:
 - a. Show size, hanger length, and location of seismic restraints for piping and ductwork.
 - b. Show details for each isolator and seismic brace with snubbers proposed for specified equipment.
 - c. Show details for proposed structural steel frames and rails and for anchors to be used in conjunction with isolation of equipment.
 - d. Show locations of piping and ductwork restraints on installation and fabrication floor plans (not bid set of documents of floor plans), noting size and type of restraint to be used.
 - e. Show details of supports, hangers, anchorage, and bracing for isolated equipment as designed or proposed by professional engineer employed by Restraint Manufacturer and qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for seismic bracing and anchors shall bear engineer's signed professional seal.
 - f. Include anchor bolt calculations, signed and stamped by registered engineer, showing adequacy of bolt sizing and type.

- 1) Calculations shall include anchor embedment, minimum edge distance and minimum center distance.
- 2) Design lateral forces shall be distributed in proportion to mass distribution of equipment.
- 3) Furnish calculations for anchors on restraint devices, cable, isolators, and on rigidly mounted equipment.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: System design and installation shall meet seismic requirements as defined in 2000 Edition of International Building Code and applicable state and local codes in accordance with minimum restraint capability of 1.0 g.
- B. Seismic Requirements: Mechanical equipment, piping, and ductwork shall be braced, snubbed, or supported to withstand seismic disturbances and remain operational.
- C. Vibration Isolation Requirements: Isolate equipment from structure by means of resilient vibration and noise isolators.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 1. Type One Acceptable Manufacturers:
 - a. Amber / Booth Company, Houston, TX www.amberbooth.com.
 - b. Mason Industries Inc, Hauppauge, NY www.mason-ind.com.
 - c. Vibration Mountings and Control Inc, Bloomington, NJ (201) 838-1780.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
 1. Design Criteria:
 - a. Isolation And Seismic Equipment:
 - 1) Piping: Restrain piping in accordance with Figures 4.11 to 4.19 in SMACNA Manual.
 - 2) Equipment with Fixed Anchor or Support:
 - a) Restraint designed according to Sections 1621 and 1622 of International Building Code.
 - b) Horizontal force factor for elements of structures:
 - (1) In addition, vertical force restraint requirement shall be computed at 1/2 value of horizontal forces.
 - (2) Restrain equipment not anchored directly to floors by cable system designed and furnished by Restraint Manufacturer.
 - 3) Ductwork: Restrain ductwork in accordance with Figures 4.2 to 4.10 in SMACNA Manual as appropriate.
 - b. Vibration Isolation Requirements:
 - 1) Unless otherwise noted, isolate HVAC equipment one horsepower and over from structure by means of resilient vibration and noise isolators in accordance with ASHRAE HANDBOOK 2003 - HVAC Applications, Table 42, Chapter 47.
 - 2) Design and install isolation equipment, hangers, connections, and other isolating devices to prevent transmission of vibration to structure from equipment and associated piping and ductwork.
 - 3) For floor-mounted equipment, use recommendations of Table 42.
 - 4) For roofs and floors constructed with open web joists, thin long span slabs, wooden construction and unusual light weight construction, evaluate equipment weighing more than 300 pounds to determine additional deflection of structure caused by equipment weight. Isolator deflection shall be 15 times additional deflection or deflection shown in Table 42, whichever is greater.

- 5) Under-Equipment Spring Isolators:
 - a) Equal to Mason SSLFH earthquake motion restrained spring mounts with freestanding stable steel springs, leveling bolts, corrosion resistant finish, motion limiting design, uplift restraining bolts, and 1/4 inch ribbed neoprene noise stop pad.
 - b) Isolators shall accept force in any direction up to 1.0 g without failure, and shall limit movement to **3/4 inch 19 mm** in any direction.
 - c) Springs shall have 50 percent overload capacity.
 - d) Size as required to achieve specified static deflection.
 - e) Outer diameter of spring proper shall not be less than 0.8 of spring height when in loaded position.
- 6) Overhead Support Spring And Rubber Hangers:
 - a) Combination spring and neoprene hangers.
 - b) Hanger bracket shall have 500 percent overload capability and shall allow up to 15 degree hanger rod misalignment without short-circuiting.
 - c) Springs shall have 50 percent overload capacity.
 - d) Provide seismic bracing as required.
- 7) Isolate piping and ductwork in mechanical equipment room and piping and ductwork three supports away or 50 feet from other mechanical equipment, whichever is greater, from structure by means of vibration and noise isolators.
 - a) Isolate suspended piping with combination spring and fiberglass hangers in supporting rods.
 - b) Support floor-mounted piping directly on spring mounts.
- 8) Isolate vertical pipe risers from structure using vibration and noise isolating expansion hangers having minimum rated deflection of four times anticipated pipe movement. Enclose in housing for fail-safe equipment.
- 9) Incorporate flexible connectors in piping adjacent to reciprocating equipment.
- 10) Incorporate flexible connections in ductwork adjacent to air-moving units.
- 11) Elastomeric Isolator: Neoprene or high quality synthetic rubber with anti-ozone and anti-oxidant additives.
- 12) Nuts, Bolts, And Washers: Electroplated zinc.
- 13) Isolators Exposed To Weather: Cadmium plated and neoprene coated springs.
- c. Seismic restraint equipment and resilient isolation devices shall be designed and furnished by single Manufacturer:

C. Finishes:

- 1. Clean and paint steel components. Thoroughly clean structural steel bases of welding slag and prime with zinc-chromate or metal etching primer. Etch and paint hot dipped galvanized steel components.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Isolation Equipment:
 - 1. Mount vibration isolated equipment on rigid steel frames or concrete bases unless Equipment Manufacturer certifies direct attachment capability.
 - 2. Install snubbers with factory set clearances.
 - 3. Piping:
 - a. Protect isolated and non-isolated piping **2-1/2 inches 63 mm** inside diameter and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motions.
 - b. Locations shall be as scheduled and include, but not be limited to:
 - 1) At drops to equipment and at flexible connections.
 - 2) At 45 degree or greater changes in direction of pipe.
 - 3) At horizontal runs of pipe **30 feet 9 000 mm** maximum on center spacing.
 - 4) Gas piping shall have additional restraints as scheduled.
 - 4. Ductwork:

- a. Protect isolated and non-isolated rectangular ductwork 4 sq ft in cross-sectional area and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motion.
- b. Locations shall be determined by Seismic Restraint Manufacturer and include, but not be limited to:
 - 1) Horizontal runs of ductwork **30 feet 9 000 mm** maximum on center spacing.
 - 2) 45 degree or greater changes in direction of ductwork.
 - 3) Each end of duct runs and drops of equipment.
 - 4) Each flexible connection.

B. Vibration Isolation: Install piping and ductwork to prevent transmission of noise and vibration into structure.

END OF SECTION

SECTION 23 0553**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install identification of HVAC equipment and piping as described in Contract Documents.

PART 2 - PRODUCTS**2.1 SYSTEMS**

A. Description:

1. Abbreviations for Pipe Stencils and Equipment Identification and Band Colors for Pipe Identification:
 - a. Apply stenciled symbols and continuous painting as follows:

Pipe Type	Pipe Color	Symbol
Gas	Yellow	GAS
 - b. Apply stenciled symbols and color banding as follows. Extend color band **2 inches** 50 mm minimum beyond each side of stenciled symbols.

Pipe Type	Band Color	Symbol
Steam Lines	Orange	STM
Steam Condensate Return	Lt Orange	COND
Hot Water Heating	Green	HWH
Chilled Water	Blue	CHW

B. Materials:

1. Paint:
 - a. Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA www.ppgaf.com.
 - b. One Coat Primer:
 - 1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
 - 2) 6-205 Metal Primer under dark color paint.
 - 3) 6-6 Metal Primer under light color paint.
 - c. Finish Coats: Two coats 53 Line Acrylic Enamel.
 - d. Class Two Quality Standard. See Section 01 6200.
 - 1) Paint of equal quality from other Manufacturers may be used. Maintain specified colors, shades, and contrasts.
2. Labels:
 - a. Equipment Identification: Black formica, with white reveal when engraved. Lettering to be **3/16 inch** 5 mm high minimum.

PART 3 - EXECUTION**3.1 APPLICATION**

A. Labels:

1. Identify following items with specified labels fastened to equipment with screws:
 - a. Thermostats and control panels in mechanical spaces.
 - b. Furnaces.

I. D. For HVAC Piping And Equipment

GSH Engineering LLC; Project No. 2523

- c. Condensing units.
- d. Air handling units and fan coil units.
- e. Evaporative Cooling Units.
- f. Accessible exhaust fans.

2. Identify following items with specified labels fastened to equipment with screws:
 - a. Thermostats and control panels in mechanical spaces.
 - b. Accessible exhaust fans.
3. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Area served.
 - c. Thermostat zone number, when different from equipment mark.
 - d. Panel and breaker from which unit is powered.

B. Painting:

1. Leave equipment in like-new appearance.
2. Only painted legends, directional arrows, and color bands are acceptable.
3. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every **25 feet 7500 mm** on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.

END OF SECTION

SECTION 23 07 16**DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 31 14: Low-Pressure Metal Ducts.
 - 2. Section 23 33 00: Acoustic duct liner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Certainteed St Gobain, Valley Forge, PA www.certainteed.com.
 - 2. Johns-Manville, Denver, CO www.jm.com.
 - 3. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.
 - 4. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
 - 5. Owens-Corning, Toledo, OH www.owenscorning.com.

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
 - 1. **1-1/2 inch 38 mm** thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of one lb/ per cu ft.
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at **75 deg F 24 deg C** maximum.
 - 3. Type One Acceptable Products:
 - a. Type 100 standard duct insulation by Certainteed St Gobain.
 - b. Microlite FSK by Johns-Manville.
 - c. Duct Wrap FSK by Knauf Fiber Glass.
 - d. Alley Wrap FSK by Manson Insulation Inc.
 - e. FRK by Owens-Corning.
 - f. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Thermal Wrap Duct Insulation:
 - 1. Install insulation as follows:
 - a. On outside air ducts and combustion air ducts within building insulation envelope.
 - b. On other air ducts where indicated on Drawings.
 - 2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum **2 inches 50 mm**.
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be **one inch 25 mm** thick.

- b. Remove insulation from lap before stapling.
- c. Staple seams at approximately **16 inches 400 mm** on center with outward clenching staples.
- d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.

B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

END OF SECTION

SECTION 23 07 19**HVAC PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on above ground refrigerant piping and fittings as described in Contract Documents.
 - 2. Furnish and install insulation for hot water heating and return piping system as described in Contract Documents.
 - 3. Furnish and install insulation for steam and condensate piping system as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 05 01: General Mechanical Requirements.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials and work dry and free from damage.
- B. Replace wet or damaged materials at no additional cost to Owner.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armaflex.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. Foster Products Corp, Oakdale, MN www.fosterproducts.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, BC, Canada www.isolationmanson.com.
 - g. Nitron Industries, Thousand Oaks, CA www.nitronindustries.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com.
 - i. Ramco, Lawrenceville, NJ www.ramco.com.
 - j. Nomac, Zebulon, NC www.nomaco.com.
 - k. Speedline Corp, Solon, OH www.speedlinepvc.com.

- B. Materials:
 - 1. Refrigeration Piping System:
 - a. Thickness:

Pipe Size, Outside Diameter	Insulation Thickness
One inch and smaller	1/2 Inch
1-1/8 to 2 inch	3/4 Inch
2-1/8 inches and larger	One inch or two layers of 1/2 inch

Pipe Size, Outside Diameter	Insulation Thickness
25 mm and smaller	13 mm
29 to 50 mm	19 mm

54 mm and larger	25 mm or two layers of 13 mm
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1) One inch 25 mm sheet for fittings as recommended by Manufacturer.

2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a) AP Armaflex 25/50 by Armacell.
- b) Nitrolite by Nitron Industries. White only for exterior.
- c) Nomaco K-Flex.

b. Joint Sealer:

1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a) Armacell 520 by Armacell.
- b) Namaco K-Flex R-373.

c. Insulation Tape:

1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a) Armaflex AP Insul Tape by Armacell.
- b) FT182 Tape by Nitron Industries.
- c) Elastomeric Foamtape by Nomac K-Flex.

d. Exterior Finish:

- 1) For application to non-white, exterior insulation.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a) WB Armaflex Finish by Armacell.
- b) R-374 Protective Coating by Nomaco K-Flex.

2. Hot-Water-Heat Piping Systems:

a. Piping Insulation:

- 1) Heavy density fiberglass with fire retardant vapor barrier jacket with self-sealing laps. Thickness shall be 1-1/2 inches 39 mm on heating supply and return lines.
- 2) Performance Standard: Fiberglas heavy density with ASJ-SSL jacket by Owens-Corning.
- 3) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.

- a) Manson.
- b) Johns Manville.
- c) Owens-Corning.

b. Vapor Barrier Adhesive: As recommended by Insulation Manufacturer.

c. Covers For Valves And Fittings:

- 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.

- a) Zeston by Johns Manville.
- b) Speedline.

d. Shields: 22 ga 0.8 mm by 12 inch 300 mm long galvanized steel.

e. Hydraulic Setting Insulating Cement:

- 1) Class Two Quality Standard: Ramco Finishing Cement 1200.

f. Weather Barrier Mastic:

- 1) Water based vinyl-acrylic mastic coating.
- 2) Class Two Quality Standard: Childers / Foster CP-10 / CP-11.

g. Canvas: 4 oz 68 g

3. Steam-Heat Piping System:

a. Fiberglass with integral vapor barrier jacket designed for use on steam systems.

b. Insulation Thickness: For piping exposed to outdoor air, increase thickness by 1/2 inch 50 mm.

Piping System Types	Temperature Range, Deg F	Insulation Thickness for Size of Pipe		
		One to 2 Inches	2-1/2 to 4 Inches	5 Inches and Larger
Steam	306 to 450	1-1/2 Inches	2 Inches	3-1/2 Inches
Steam Condensate	Any	One Inch	1-1/2 Inches	2 Inches

Piping System Types	Temperature Range, Deg C	Insulation Thickness for Size of Pipe		
		25 to 50 mm	63 to 100 mm	125 mm and Larger
Steam	150 to 232	38 mm	50 mm	88 mm
Steam Condensate	Any	25 mm	38 mm	50 mm

c. For piping exposed to outdoor air, increase thickness by 1/2 inch 50 mm.

- d. Vapor Barrier Adhesive: As recommended by Insulation Manufacturer.
- e. Hydraulic Insulating Cement:
 - 1) Class Two Quality Standard. See Section 01 6200.
 - a) Ramco Finishing Cement 1200.
- f. Weather Barrier Mastic:
 - 1) Water based vinyl-acrylic mastic coating.
 - 2) Class Two Quality Standard. See Section 01 6200.
 - a) Childers / Foster CP-10 / CP-11.
- g. PVC jacket.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before application of insulating materials, brush clean surfaces to be insulated and make free from rust, scale, grease, dirt, moisture, and any other deleterious materials.
- B. Use drop cloths over equipment and structure to prevent adhesives and other materials spotting the work.

3.2 INSTALLATION

- A. Refrigeration System Piping System:
 - 1. General:
 - a. Install insulation in snug contact with pipe.
 - 1) Insulate flexible pipe connectors.
 - 2) Insulate thermal expansion valves with insulating tape.
 - 3) Insulate fittings with sheet insulation and as recommended by Manufacturer.
 - b. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Do not install insulation on lines through clamp assembly of pipe support. Butt insulation up against sides of clamp assembly.
 - d. Stagger joints on layered insulation. Seal joints in insulation.
 - e. Install insulation exposed outside building so 'slit' joint seams are placed on bottom of pipe.
 - f. Paint exterior exposed, non*white insulation with two coats of specified exterior finish.
 - 2. System Requirements:
 - a. Condensing Units: Install insulation on above ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve.
 - b. Split System Heat Pump Units: Install insulation on above ground refrigerant liquid and suction piping and fittings.
- B. Hot Water Heating System:
 - 1. Pipes:
 - a. Butt joints firmly together.
 - b. Seal vapor barrier longitudinal seam overlap with vapor barrier adhesive.
 - c. Wrap butt joints with **4 inch 100 mm** strip of vapor barrier jacket material cemented with vapor barrier adhesive.
 - d. Finish with bands applied at mid-section and at each end of insulation.
 - 2. Valves And Fittings:
 - a. Insulate by one of following methods:
 - 1) With hydraulic setting insulating cement, or equal, to thickness equal to adjoining pipe insulation.
 - 2) With segments of molded pipe insulation securely wired in place.
 - b. Finish fittings and valves with canvas coated with weather barrier mastic or securely fitted Zeston covers.
 - 3. Pipe Hangers: Provide shields at each pipe hanger to protect pipe insulation from crushing.

3.3 FIELD QUALITY CONTROL

- A. Method of installing insulation shall be subject to approval of Architect. Sloppy or unwork manlike installations are not acceptable.

3.4 CLEANING

- A. Leave premises thoroughly clean and free from insulating debris.

3.5 PROTECTION

- A. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

END OF SECTION

SECTION 23 09 23
Direct-Digital Control System for HVAC

PART 1-

1.1 DESCRIPTION

General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface.

System software shall be based on a server/thin client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the owner's local area network, and (at the owner's discretion) over the Internet.

The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a web browser shall be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.

System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends and alarms specified in Sequence of Operations for HVAC Controls" shall be BACnet objects.

1.A Related Documents

1. All work of this Division shall be coordinated and provided by the single BMS Contractor.
2. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the applicable sections for details.
3. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
4. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.B Definitions

1. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
2. Binary: A two-state system where an "on" condition is represented by one discrete signal level and an "Off" condition is represented by a second discrete signal level.
3. BMS: The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BMS Contractor and to be interfaced to the associated work of other related trades.
4. BMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BMS work.

5. Control Sequence: A BMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.
6. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.
7. BMS Network: The total digital on-line real-time interconnected configuration of BMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.
8. Node: A digitally programmable entity existing on the BMS network.
9. BMS Integration: The complete functional and operational interconnection and interfacing of all BMS work elements and nodes in compliance with all applicable codes, standards and ordinances to provide a single coherent BMS as required by this Division.
10. Provide: The term "Provide" and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.
11. PC: Personal Computer from a recognized major manufacturer or a virtual equivalent provided by, or with the consent of the owner.
12. Furnish: The term "Furnish" and its derivatives when used in this Division shall mean supply at the BMS Contractor's expense to the designated third party trade contractor for installation. BMS Contractor shall connect furnished items to the BMS, calibrate, test, commission, warrant and document.
13. Wiring: The term "Wiring" and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.
14. Install: The term "Install" and its derivatives when used in this Division shall mean receive at the jobsite and mount.
15. Protocol: The term "protocol" and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BMS network nodes.
16. Software: The term "software" and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BMS industry for real-time, on-line, integrated BMS configurations.
17. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.
18. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

1.C BMS System Description

1. The BMS shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.
2. Any and all components of the BMS that are connected via field bus or IP network, including the network controllers, field controllers, application specific controllers, server and user interface software, system and controller programming tools and software applications shall be designed, engineered, and tested to work together as a complete building management system, and shall be manufactured by the same BMS manufacturer. Systems that use or require network controllers, field controllers, application specific controllers, server and user interface software, programming tools and software from more than one BMS manufacturer shall not be accepted.
3. All points of user interface shall be on standard computing devices that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these devices will be a standard Web Browser.
4. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.
5. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.
6. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
7. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as not to impede or delay the work of associated trades.
8. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
 - a. Operator information, alarm management and control functions.
 - b. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
 - c. Diagnostic monitoring and reporting of BMS functions.

- d. Energy management.
- e. Standard applications for terminal HVAC systems.
- f. Enterprise-wide information and control access.
- g. Offsite monitoring and management access.
- h. [Indoor Air Quality monitoring and control].

1.D Quality Assurance

1. General

- a. The BMS Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated BMS.
- b. The BMS Contractor shall be a recognized national manufacturer, installer and service provider of BMS.

1.2 APPROVED CONTROL SYSTEM MANUFACTURERS

The following are approved control system suppliers, manufacturers, and product lines:

Supplier	Manufacturer	Product Line
JCI – Branch Office Noe Salinas	JCI	Brand - Metasys

Or as approved by UTRGV IT department.

- 1. The BMS installer shall be a BMS manufacturer-owned branch office, or an independent controls contractor who is factory trained and authorized by the BMS manufacturer to sell, service and support the BMS specified herein.
- 2. All work shall conform to the following Codes and Standards, as applicable:
 - a. National Fire Protection Association (NFPA) Standards.
 - b. National Electric Code (NEC) and applicable local Electric Code.
 - c. UL listing and labels.
 - d. UL 864 UUCL Smoke Control.
 - e. UL 268 Smoke Detectors.
 - f. UL 916 Energy Management.
 - g. NFPA 70 – National Electrical Code.
 - h. NFPA 90A – Standard For The Installation Of Air Conditioning And Ventilating Systems.
 - i. NFPA 92A and 92B Smoke Purge/Control Equipment.
 - j. Factory Mutual (FM).

- k. American National Standards Institute (ANSI).
- l. National Electric Manufacturer's Association (NEMA).
- m. American Society of Mechanical Engineers (ASME).
- n. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- o. Air Movement and Control Association (AMCA).
- p. Institute of Electrical and Electronic Engineers (IEEE).
- q. American Standard Code for Information Interchange (ASCII).
- r. Electronics Industries Association (EIA).
- s. Occupational Safety and Health Administration (OSHA).
- t. American Society for Testing and Materials (ASTM).
- u. Federal Communications Commission (FCC) including Part 15, RF Devices.
- v. Americans Disability Act (ADA).
- w. ANSI/EIA 909.1-A-1999 (LonWorks®).
- x. ANSI/ASHRAE Standard 195 (BACnet).
- y. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

3. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.E Work By Others

1. The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX.

BMS Responsibility Matrix

Work	Furnish	Install	Low Volt. Wiring/Tube	Line Power
BMS low voltage and communication wiring * ¹ (note 1)	BMS	BMS	BMS	N/A
VAV box controller (note 2)	BMS	23* ²	BMS	26
BMS conduits and raceway	BMS	BMS	BMS	BMS
Automatic dampers (non factory)	BMS	23	N/A	N/A
Automatic valves	BMS	23	BMS	N/A
VAV boxes	23	23	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations.	BMS	23	BMS	BMS
BMS Current Switches.	BMS	BMS	BMS	N/A
BMS Control Relays	BMS	BMS	BMS	N/A
Power distribution system monitoring interfaces	26	26	BMS	26

Work	Furnish	Install	Low Volt. Wiring/Tube	Line Power
Concrete and/or inertia equipment pads and seismic bracing	23	23	N/A	N/A
All BMS Nodes, equipment, housings, enclosures and panels.	BMS	BMS	BMS	BMS
Smoke Detectors (note 4)	26	26	26/BMS * ⁴	26
Fire/Smoke Dampers (note 5)	23	23	BMS* ⁵	26
Fire Dampers	23	23	N/A	N/A
Computer Room A/C Unit field-mounted controls	23	23	BMS	26
Fire Alarm shutdown relay interlock wiring	26	26	26	26
Fire Alarm smoke control relay interlock wiring	26	26	BMS	26
Fireman's Smoke Control Override Panel	26	26	26	26
Fan Coil Unit controls	BMS	BMS	BMS	26
Cabinet/Unit Heater controls (note 6)	BMS/23* ⁶	26/BMS* ⁶	BMS	26
Packaged RTU space mounted controls	23	BMS	BMS	26
Starters, HOA switches	26	26	N/A	26
Control damper actuators	BMS	BMS	BMS	26

Footnotes:

- *1. BMS low voltage and communications wiring: BMS Ethernet communications cable and IP infrastructure furnish and install by BMS Contractor or Division 26 Electrical Contractor as per options in Paragraph 2, A6 above.
- *2. VAV box controller factory installation would normally be by Division 23 Mechanical who furnishes the VAV boxes; could be by BMS for field installation of special controllers, see item.
- *3. Electric Baseboard Heating Controls – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who furnishes the baseboard units; line voltage controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring Baseboard Heating controls to be integrated into the BMS. Refer to Section 230993 SEQUENCE OF OPERATIONS.
- *4. Smoke Detector also wired to shut down AHU/HVAC by BMS Contractor; Division 26 for projects NYC.
- *5. Fire/Smoke Dampers: BMS Contractor to provide and ensure OPEN/CLOSE control of Fire/Smoke dampers as coordinated between BMS HVAC systems sequences, controls and overrides, and the Fire Alarm system control status priorities and overrides.
- *6. Cabinet/Unit Heater Controls – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who furnishes the Cabinet/Unit Heaters; line voltage stand-alone controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring Cabinet/Unit Heater controls to be integrated into BMS. Refer to Section 230993 SEQUENCE OF OPERATIONS.

1.F Submittals

1. Shop Drawings, Product Data, and Samples
 - a. The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.
 - b. Submittals shall be in defined packages. Each package shall be complete, shall only reference itself, and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
 - c. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.
 - d. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
 - e. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
 - f. The BMS Contractor shall correct any errors or omissions noted in the first review.
 - g. At a minimum, submit the following:
 - BMS network architecture diagrams including all nodes and interconnections.
 - Systems schematics, sequences, and flow diagrams.
 - Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
 - Samples of Graphic Display screen types and associated menus.
 - Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
 - Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
 - Room Schedule including a separate line for each VAV box and/or terminal unit indicating location and address.
 - Control Valve Schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Design Pressure, and Actuator Type.
 - Details of all BMS interfaces and connections to the work of other trades.
 - Product data sheets or marked catalog pages including part number, photo and description for all products including software.

2. Existing Systems Inventory

- a. Where applicable, provide a complete and current BMS site inventory for all existing field and supervisory controllers to be integrated into the new BMS including manufacturer, model number, firmware version, available updates, battery condition, integrations, controlled equipment, and point counts.
- b. Site inventory shall be provided on a separate, new USB compatible flash drive.

1.G Record Documentation

1. Operation and Maintenance Manuals.
 - a. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media or USB Flash Drive, and include the following for the BMS provided:
 - Table of contents.
 - As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
 - Manufacturer's product data sheets or catalog pages for all products including software.
 - System Operator's manuals.
 - Archive copy of all site-specific databases and sequences.
 - BMS network diagrams.
 - Interfaces to all third party products and work by other trades.
2. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server.

1.H Warranty

1. Standard Material and Labor Warranty:
 - a. Provide a one-year labor and material warranty on the BMS.
 - b. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.
 - c. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor's normal business hours.

Part 2 – Products

2.A General Description

1. The BMS shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards

and integrate a wide variety of third party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

2. The BMS shall consist of the following:
 - a. Network Engine(s)
 - b. Field Equipment Controller(s)
 - c. Input/Output Module(s)
 - d. Local Display Device(s)
 - e. Portable Operator's Terminal(s)
 - f. Distributed User Interface(s)
 - g. Network processing, data storage and communications equipment
 - h. Other components required for a complete and working BMS
3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
 - a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
 - b. The System shall maintain all settings and overrides through a system reboot.
5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
6. The System shall comply with the following International Code Council (ICC) Codes:
 - a. Building Officials and code Administrators International (BOMA) model code.
 - b. International Conference of Building Officials (ICBO) model code.
 - c. Southern Building Code Congress International (SBCCI) regulations.
7. Acceptable Manufacturers
 - a. Johnson Controls, Metasys.

2.B BMS System Architecture

1. Automation Network
 - a. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
 - b. The BMS shall network multiple user interface clients, application and data servers, automation engines, system controllers and application-specific controllers including but not limited to:
 - i. Network Automation Engines

- ii. Select Field Equipment Controllers
- c. Third Party BACnet controllers and peripheral devices with compatibility listed by BACnet International
- d. Application and Data Server.
- e. All BMS devices on the automation network shall be capable of operating at a minimum communication speed of 100 Mbps, with full peer-to-peer network communication.
- f. Network Security – To protect the BMS from unauthorized users and computer hackers the Automation Network shall support HTTPS with TLS 1.2 between components, including the Application and Data Server(s), Network Engines, Mobile User Interface and Site Management Portal. Self-signed certificates are installed on supported products, with the option of configuring trusted certificates. Computing devices supplied by the BMS vendor will automatically shut down unused ports to deter unauthorized access.
- g. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

2. Control Network

- a. Network Engines (NAE) shall provide supervisory control over the control network and shall selectively support the following communication protocols:
 - i. BACnet Standard Master-Slave/Token-Passing (MS/TP) Bus Protocol ASHRAE SSPC-135:
 - a) The NAE shall be BTL certified and carry the BTL Label.
 - b) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
 - ii. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
 - iii. The Johnson Controls N2 Field Bus.
 - iv. Modbus® TCP and RTU.
- b. Control networks shall provide either “Peer-to-Peer”, Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
- c. Control network shall support digital controllers as indicated in plans and specifications.
- d. Default control network communication protocol for this project shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.
- e. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
- f. The PICS shall be submitted 10 days prior to bidding.

3. Integration

Note: Selected Integration option to be BACnet

- a. Hardwired
 - i. Analog and digital signal values shall be passed from one system to another via hardwired connections.
 - ii. There will be one separate physical point on each system for each point to be integrated between the systems.
- b. BACnet Protocol Integration – BACnet
 - i. The neutral protocol used between systems will be BACnet IP and comply with the ASHRAE BACnet standard 135.
 - ii. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
 - iii. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.C User Interface

1. Dedicated Web Based User Interface

- a. Where indicated on plans the BMS Contractor shall provide and install a personal computer for command entry, information management, network alarm management, and database management functions. Real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines and Data Server(s) to facilitate greater fault tolerance and reliability.
- b. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.
 - i. Microsoft Internet Explorer 11.0 or Edge for user interface functions.
 - ii. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions.
 - iii. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports.
 - iv. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.
- c. PC Hardware/Software – The personal computer(s) shall be configured as specified in the Computing Hardware and Software section.
- d. Provide one operational device as herein specified and located on plans.

2. Mobile, Web Based, User Interface (MUI)

- a. General

- i. The mobile, web based, user interface shall be HTML5-compliant and provide device-agnostic access to the system from smartphones, tablets, portable and desktop computers. User Interfaces that require software installation on the client device (e.g. Java, MicrosoftSilverlight®, Adobe® Flash®), or software downloads from an online app store shall not be acceptable for these purposes.
- ii. The mobile user interface shall provide system operators with a simple location-based navigation approach to finding information, including the ability to search for any location by name and to bookmark a location in a standard browser.
- iii. The mobile user interface shall organize and display information using customer specific locations and spaces. At a minimum, the user interface shall provide:
 - Organization of all space, equipment and point information in a familiar way (using standard equipment names and location descriptions), reducing the need for extensive training prior to use.
 - A navigation mechanism or tree for users to select the specific location or space for accessing information – only spaces and locations in the navigation tree or equipment serving that space, nothing more.
 - The ability to search for and/or bookmark any location, space, or equipment by name for quick access to critical or troublesome areas.
 - Application of the same navigation mechanisms across any client device (e.g. Smart phone, tablet, personal computer) for consistency and ease of use.
- iv. The same user interface elements shall be accessible from any type of personal computer or mobile device running any type of operating system supported (e.g. iOS, Android, Windows®). It shall automatically adapt and optimize the display for the screen size and touch screen navigation.
- v. The user interface shall provide support for up to 50 concurrent users from individuals with defined access to the system.

b. Navigation Trees

- i. A dedicated location based navigation tree shall be provided as part of the user interface in order to navigate to specific places within the facility on a hierarchical basis (typ. Facility, Building, Wing, Floor, Room.)
- ii. The location-based tree shall use place names familiar to the operator without training or familiarization regarding special codes and conventions utilized in the generation of the BMS.
- iii. Clicking or tapping on a location name in the tree shall display the home page associated with the space and simultaneously expand the tree to display the next level of spaces below the one selected.
- iv. It shall be possible for qualified users to view a navigation tree of devices connected to the BMS network in order to enable troubleshooting of equipment and communications. Clicking or tapping on the Network Icon at the top of the Navigation Tree will access this alternate view. Users without the necessary access rights shall not see the Network Icon.

- v. A click or tap on a device in the network tree shall display a dashboard for that device including information regarding related equipment and access to a separate focus view of commandable points associated with the piece of hardware. A click or tap on such a point shall display a control dialogue box allowing the user to modify or command that point as indicated. The dialog box shall contain an annotation box for describing why the action was taken or special circumstances that apply.
- vi. Specific hardware and software types in the Network tree shall also include access to one or more the following views in their dashboard depending on hardware type or network element (e.g. MS/TP trunk):
 - Summary View
 - Diagnostic View
 - Network View
 - Trend View
- vii. It shall be possible to hide the Network Tree and return to the Spaces Tree at any time by clicking on the Spaces Icon above the tree.

c. Dashboard Displays

- i. The user interface shall provide the ability to view equipment visualizations, floor plans, and/or other graphics on mobile or desktop client devices in a browser environment, without the need for additional plugins or software. Graphics shall be accessible via a space (for floorplans, campus maps, etc.) or equipment dashboard.
- ii. Users with appropriate permissions shall have access to a Dashboards Manager that can change the display order of Summaries and Data elements, add or remove elements and apply custom dashboards layouts to equipment and space by type.
- iii. Dashboard Manager shall apply dashboards to spaces or equipment based on the viewing platform (Desktop/Tablet or Phone) in order to tailor the user experience to the needs of the specific user base.
- iv. Default dashboard displays by space and equipment type shall be created per the guidelines in this specification or by mutual agreement with the owner's representative.

d. Alarm Management

- i. The user interface shall provide a single display of all potential issues in a facility including items currently in alarm, warning, override, out-of-service and offline.
- ii. The user interface shall provide notification of new alarms, visually and audibly.
- iii. The user interface shall provide the ability to view a summary of alarms, including a chart of the number of alarms in each of the defined alarm priority ranges. The priority ranges should be filterable.

- iv. The user interface shall provide the capability to view multiple occurrences of the same alarm, ultimately providing the ability to acknowledge or discard all occurrences of the alarm in a single action.
- v. The user interface shall provide the capability to view, and filter on, all alarms present in a well-defined mechanical system using the equipment serving equipment relationships.
- vi. The user interface shall provide the capability to acknowledge and discard all occurrences of at least 1000 alarms in one operation.
- vii. The user interface shall provide the user with the understanding of what physical space is being affected when an alarm occurs. The user interface shall provide the ability to filter alarms by physical space affected when the alarm occurred.
- viii. The user interface shall provide the capability to monitor alarms 24/7 without requiring an active login to the system, accessible via segregated web page. The user interface shall provide the capability to enable or disable the 24/7 alarm monitor mode if desired.

- e. Equipment Activity Summary
 - i. The user interface shall provide a filterable, single display, of all activity related to a specific piece of equipment including user changes, discarded user changes, pending alarms, discarded alarms, and acknowledged alarms for at least one year of historical data.
 - ii. Items shall be listed in timed order with the latest activity at the top of the list.
 - iii. Filters shall allow only specific activities for specific data points occurring within a specific time and date window to be displayed.
 - iv. It shall be possible to export a .csv copy of the currently displayed summary by clicking or tapping on the export icon.
 - v. It shall be possible to create a custom trend graph containing the data shown in the currently displayed summary by tapping or clicking on the trend icon in the header bar and selecting the specific points to trend in the resulting selection panel.
 - vi. Clicking on the information icon in front of any displayed activity listed in the summary shall expand the display to include the name of the user, server time, value prior to the activity, the ability to annotate the activity and a user selectable icon for displaying a trend graph of the point.
- f. Equipment Relationships Summary
 - i. The user interface shall provide a summary of all equipment and spaces related to the operation of the system or device currently selected for viewing.
 - ii. Include the capability to navigate to the home page of any related piece of equipment or space with a single click or tap on the desired element.
- g. Equipment Data Summary

- i. The user interface shall provide a summary of all data pertaining to a particular piece of mechanical or electrical equipment in a tabular format.
- ii. Clicking or tapping on any value in the summary shall display a related command panel allowing the user to command, override, or change service condition of the point selected and to annotate such actions for future reference.
- iii. It shall be possible to export a .pdf copy of the report with a single click on the associated export icon.

h. Equipment Serving Space Summary

- i. The user interface shall provide a summary of all mechanical and electrical equipment as defined in the points list that serves a selected space from the navigation tree.
- ii. The summary shall be capable of including a subset of the viewable points for each system representing the key elements of interest to operators without subjecting them to long lists of points irrelevant to basic operation.
- iii. Clicking or tapping on any item in the summary shall navigate to the item's assigned home page in the user interface.
- iv. It shall be possible to view a custom trend of information contained in the summary with a single click of the trend icon residing in the title header.
- v. It shall be possible to display specific systems and points by filtering equipment types desired.
- vi. Because the data is intended to be a snapshot of the current conditions in the space it shall not dynamically update but a click or tap on the update icon at any time performs that function.

i. Potential Problem Areas

- i. The user interface shall provide a summary of all points in the system related to the space that are not operating correctly (e.g. alarm, off normal or not communicating correctly) in order to provide the operator with a quick update on current conditions.
- ii. The information shall include:
 - Point status (via color.)
 - Point name.
 - Value of the point when the summary was taken.
 - Equipment that contains the offending point.
 - Space that is served by that equipment.
- iii. Data points in the summary may be filtered by one or more types of off-normal condition (e.g. above setpoint, offline and overridden).
- iv. The summary may be exported in .csv format for inclusion in spreadsheets or other documents.

j. Equipment Summary

- i. The user interface shall provide a summary that allows the user to compare all similar equipment that serves the space as well as downstream (child) spaces in order to evaluate conditions quickly and determine patterns for troubleshooting purposes.
- ii. Each unique equipment type shall be selectable and display a representative set of values along with the space(s) being served by the device. Equipment types can be selected from a dropdown menu in the summary.
- iii. Clicking or tapping on a selected device in the summary shall navigate to the home page for that piece of equipment while clicking or tapping a data point shall display the command panel for that point.
- iv. It shall be possible to export a .pdf copy of the currently displayed summary by clicking or tapping on the export icon.
- v. It shall be possible to create a custom trend graph containing the data shown in the currently displayed summary by clicking on the trend icon in the header bar and selecting the specific points to trend in the resulting selection panel.

k. User Defined Summaries

- i. Provide the capability to view, command, and modify large quantities of similar data in summaries without the use of a secondary application (e.g. a spreadsheet). These summaries shall be generated automatically or user defined. User defined summaries shall allow up to seven user defined columns describing attributes to be displayed including custom column labels with up to 100 rows per summary.

l. Trend

- i. The user interface shall provide the capability to view historical trend data from multiple pieces of equipment in both bar and line formats.
- ii. The user shall have the ability to navigate to a selection list of frequently viewed trends.
- iii. Trend graphs shall have the ability to be smartly auto-generated based on equipment and space relationships.
- iv. Each graph shall include a dedicated selection icon to export a copy of the graphic and data in .pdf format or the data only as a .csv file.

m. Operator Access

- i. The user interface shall provide the ability to segment access to building data based on the space(s) or location(s) the user is physically located in and/or manages. The user interface shall provide the capability to assign “inherited” space permissions and the ability to assign user’s space based access in bulk.
- ii. The user interface shall provide the ability to segment access to building data based on the space(s) or location(s) the user is physically located in and/or manages. The user interface shall provide the capability to assign “inherited” space permissions and the ability to assign user’s space based access in bulk.

n. Graphics

- i. The user interface shall display an equipment visualization or graphic within the context of its associated space (building, floor, room, etc.) or equipment dashboard.
- ii. Graphics shall include the ability to define individual information layers for operator selection in order to clarify systems status and simplify operation on mobile devices. Where desired a master layer may be defined to include important information about the facility on all graphic screens.
- iii. Graphics shall support the use of photo-realistic symbols as well as color change and animation to match the status of the related system control point.
- iv. It shall be possible to export a time stamped .pdf file of the graphic being viewed in order to communicate the current conditions in the space or the equipment being viewed and to provide a historic record.
- v. An integral graphic manager shall be provided including the following features and capabilities:
 - Creation and modification of graphics from any HTML5 capable browser without the need for additional plug-ins or software packages.
 - Access to a full suite of pre-defined templates for air and water sourced HVAC applications as well as the ability to add custom templates as created for other use. Pre-aliased graphic templates may be defined and saved for repetitive representations of common mechanical and electrical equipment.
 - A full suite of pre-defined three dimensional symbols for mechanical and electrical systems as well as all line, text and shape tools required for integration into a graphic with zoom and pan capabilities on multiple platforms and in multiple browsers.
 - The ability to search and replace items in multiple graphics with a single command.
 - The ability to import and insert photos and images into the graphic.
 - The ability of the graphics manager to create and edit graphics including the ability to bind graphic elements to the values and conditions of system points in both an on-line and off-line mode.
- vi. As required, the BMS Contractor shall provide software licenses in the name of the owner for programming, configuration and graphics building tools to allow designated representatives to make changes, modifications or additions to the system. While future updates or revisions may require an update fee, the owner shall incur no additional cost if they choose not to update. Systems that require any annual or time-limited licensing fees shall not be permitted.

o. Scheduling

- i. The user interface shall provide the capability to display, in a singular view, all of the effective schedules in the context of the space (building/floor/room, etc.) or equipment that the schedule effects. The software should have the ability to display an effective schedule, for the present, or a future date.

- ii. The user interface shall provide a report of all schedules affecting a space or equipment. The report shall provide the user details of events that comprise the weekly schedule and exception schedule(s). The report shall provide a means of viewing individual breakout scheduling elements for Weekly Schedule, Exceptions and Default Commands.
- iii. The user interface shall provide the capability to efficiently change or modify schedules in mass quantities. This includes the capability to add, in bulk, exceptions to schedules, in addition to assigning, in bulk, weekly schedules.
- p. Command and Control
 - i. It shall be possible to command system analog and binary points via a dropdown menu accessed by clicking or tapping on the value shown in any equipment summary or graphic display and completing the task in the resultant menu including an optional annotation.
 - ii. Commanding multiple points shall be possible on displays where multiple like system elements can be chosen.
- q. Search
 - i. Typing a text string in the Search box shall display a list of all occurrences of that string in the mobile user interface. When a string is represented in the description of a space or network element, selecting it shall display its default dashboard.
 - ii. Clicking or tapping on the Advanced Search Icon shall display the Advanced Search dialog box permitting the following:
 - Search by Space and Equipment, Equipment Definition or Network Reference.
 - Filter the search by wildcard name or object type.
 - Multi-selection of objects for commanding or the creation of reports including Trend, Alarm, Audit and Activity for a specific period of time.
- r. Offline Operation
 - i. The mobile user interface shall have the ability to operate in an offline mode in order to create or edit graphics and dashboard elements.
 - ii. Content created offline shall be available to all authorized users for inclusion of an operating user interface later.

3. Site Management Portal and Associated Application Components

- a. General – The Site Management Portal and its user interface shall serve as the primary tool for creation and maintenance of the BMS.
- b. All features and functions of the Site Manager and associated user Interface defined in this document shall be available on any computer connected directly or via a WAN/VPN to the automation network and conforming to the following specifications.

- c. The software shall run be accessible and operational on a Microsoft Internet Explorer (11.0 or higher) browser and support the following functions:
 - i. Configuration.
 - ii. Commissioning.
 - iii. Data Archiving.
 - iv. Monitoring.
 - v. Commanding.
 - vi. System Diagnostics.
- d. Minimum hardware requirements for client devices:
 - i. 8GB RAM.
 - ii. 3.0 GHz Clock Speed Intel Microprocessor.
 - iii. 100 GB Hard Drive (free space for cut and paste/screen captures.)
 - iv. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth.
 - v. Mouse or other pointing device.
- e. Operator Interface
 - i. An integrated browser based client application shall be provided as the user interface program for operators familiar with the detailed operation of the BMS and charged with the maintenance and optimization of the mechanical/electrical systems in the facility.
 - ii. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
 - iii. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
 - iv. The user interface software shall provide help menus and instructions for each operation and/or application.
 - v. The system shall support customization of the user interface configuration and a home page display for each operator.
 - vi. The system shall support user preferences in the following screen presentations:
 - Alarm.
 - Trend.
 - Display.
 - Applications.
 - vii. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.

viii. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

- User access for selective information retrieval and control command execution.
- Monitoring and reporting.
- Alarm, non-normal, and return to normal condition annunciation.
- Selective operator override and other control actions.
- Information archiving, manipulation, formatting, display and reporting.
- BMS internal performance supervision and diagnostics.
- On-line access to user HELP menus.
- On-line access to current BMS as-built records and documentation.
- Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications.

ix. The system shall support a list of application programs configured by the users that are called up by the following means:

- The Tools Menu.
- Hyperlinks within displays.
- Key sequences.

x. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

f. Navigation Trees

- i. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum, provide a tree that identifies all systems on the networks.
- ii. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
- iii. The navigation trees shall be “dockable” to other displays in the user interface. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

g. Alarms

- i. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

- Log date and time of alarm occurrence.
- Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
- Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
- Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
- Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
- Configuration of which NAE offline alarms are seen by each user.
- Any attribute of any object in the system may be designated to report an alarm.

- ii. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
- iii. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined .wav files.
- iv. The BMS shall annunciate application alarms at minimum, as required by Part 3.

h. Reports and Summaries

- i. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
 - All points in the BMS.
 - All points in each BMS application.
 - All points in a specific controller.
 - All points in a user-defined group of points.
 - All points currently in alarm.
 - All points locked out.
 - All user defined and adjustable variables, schedules, interlocks and the like.
- ii. Summaries and Reports shall be accessible via standard user interface functions and not dependent upon custom programming or user defined HTML pages.
- iii. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
- iv. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user

defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

- v. Provide a focused set of reports that includes essential information required for effective management of energy resources within the facility. Energy reports shall be configurable from predefined, preconfigured templates. Reports shall be selectable by date, time, area and device. Each report shall include a color visual summary of essential energy information. Required items:
 - Energy Overview.
 - Load Profile.
 - Simple Energy Cost.
 - Consumption.
 - Equipment Runtime.
 - Electrical Energy.
 - Energy Production.
- i. Schedules
 - i. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
 - Weekly schedules.
 - Exception Schedules.
 - Monthly calendars.
 - ii. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
 - iii. It shall be possible to define one or more exception schedules for each schedule including references to calendars.
 - iv. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
 - v. Changes to schedules made from the User Interface shall directly modify the schedule database stored in an engine or server.
 - vi. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.
 - vii. The Calendar object supports an option to add a reference to another Calendar Object that is designated to be the master for the facility. Any Supervisory and BAC calendars can be configured to reference a single master Global Calendar. Changes to the master global calendar are automatically synced with all calendars that are referenced.

- viii. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.
- ix. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history.

j. Security/Passwords

- i. Multiple-level passwords access protection shall be provided via roles and permissions. The feature will allow the system to base access on a user's job title or role and allow the user/manager access interface control, display, and database manipulation capabilities based on an assigned password.
- ii. Roles may be copied and altered to meet specific roles and permissions based on the particular policies.
- iii. Each user shall have the following: a user account name (with a maximum of 30 characters), a complex password or passphrase (with a min of 8 characters and a max of 50 characters), other user account policies (such as session timeout), timesheet access based on day of the week and time of day, and specific user view.
- iv. The system shall allow each user to change his or her password at will.
- v. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
- vi. A maximum of 150 categories may be used to determine or assign areas of responsibilities to each user account. A maximum of 13 (of the 150) named categories which are specifics such as "No Access, View, Advanced Review, Operate, Intervene, Diagnostic, Manage Item Events, Manage Every, and Configure Items".
- vii. A minimum of 100 unique passwords shall be supported.
- viii. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
- ix. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.
- x. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

- xi. The system shall have the ability to provide a Department of Defense (DoD) specific warning banner for applicable sites that warns the user they are accessing a restricted site.
- xii. After successful login to the Site Management Portal (SMP) the last time and date that user name was previously logged in is shown on the screen.
- xiii. Each login attempt is recorded in the system Audit Log with the option to record the IP address of the PC that made the login.

k. Screen Manager

- i. The system will allow a customized image on the login screen (e.g. organization name, logo).
- ii. User View navigations can be displayed as either a set of tabs or a drop down list.
- iii. Allows user preference for assigning of a background color for when an object is Out of Service which will enable the operator to quickly distinguish points that have been commanded to this state.
- iv. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

l. Historical trending and data collection

- i. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:
 - Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:
 - a) Defined time interval
 - b) Upon a change of value
 - Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
- ii. The system shall provide a configurable data storage subsystem for the collection of historical data. Data can be stored in SQL database format.
- iii. The system shall provide data to enable optimization capabilities including fault detection and diagnostics, advanced analytics and central plant optimization without the need of a gateway or additional hardware.

m. Trend data viewing and analysis

- i. Provide a trend viewing utility that shall have access to all database points.
- ii. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
- iii. The trend viewing utility shall have the capability to define trend study displays to include multiple trends.

- iv. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.
- v. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.
- vi. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.
- vii. The Display shall support the user's ability to change colors, sample sizes, and types of markers.

n. Database Management

- i. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.
- ii. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.
- iii. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:
 - Backup.
 - Purge.
 - Restore.
- iv. The Database Manager shall support four tabs:
 - Statistics – shall display Database Server information and Trend, Alarm (Event), and Audit information on the Databases.
 - Maintenance – shall provide an easy method of purging records from the Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.
 - Backup – Shall provide the means to create a database backup file and select a storage location.
 - Restore – shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.
- v. The Status Bar shall appear at the bottom of all Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:
 - Ready.
 - Purging Record from a database.
 - Action Failed.
 - Refreshing Statistics.

- Restoring database.
- Shrinking a database.
- Backing up a database.
- Resetting internet information Services.
- Starting the Device Manager.
- Shutting down the Device Manager.
- Action successful.

vi. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.

vii. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

viii. The Monitoring Settings window shall have the following sections:

- General – Shall allow the user to set and review scan intervals and start times.
- Email – Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.
- Warning – shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.
- Alarm – shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.
- Database login – Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.

ix. The Monitoring Settings Taskbar shall provide the following informational icons:

- Normal – Indicates by color and size that all databases are within their limits.
- Warning – Indicates by color and size that one or more databases have exceeded their Warning limit.
- Alarm – Indicates by color and size that one or more databases have exceeded their Alarm limit.

x. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit. Provide Site Management Portal with associated user interface at each Network Engine as well as all Application and Data Servers. Device Home Page: Each controller on the MS/TP Field Bus will include a home page that can be selected on the Device List page. The Device Home Page will show the relevant value and status information for the respective controller using consistent summary graphics that are derived from the equipment model and/or standard control applications libraries. The summary graphic will change to red if there is an

alarm present for that controller. The Device Home Page will also show an alarm indication box for the highest priority alarm for that controller.

- Device Alarm Page: An Alarm Page shall allow the user to toggle between a list of Active Alarms or All Alarms. The Alarm Page shall be organized to automatically show the highest priority alarm indication for each connected device. The Alarm Page will display color differentiation of alarm priorities. The Alarm Page will provide an accordion pull-down view of reoccurring alarms, showing the date-time stamp of the alarms.
- Point View/ Edit Page: The Device Home Page shall provide a slide-over menu for each device, which will allow the user to select Point View/Edit Pages. The Point View/Edit Page will provide a scrolling list of all of the input and output points for each device, along with their respective software points. The Point View/Edit page will show the point name, status/reliability, and current value in the appropriate engineering units. An icon will appear for points that can be overridden or edited; clicking on the icon will open a point edit dialog screen. The point edit screen will show the pre-configured minimum and maximum limits; changing the point value can be done with a slider or mobile keyboard. Ex. For a VAV box controller, the technician can change temperature set points, change minimum and maximum velocity set point, display room temperature, and display duct velocity.

xi. Audit Log: Provides a log of user actions on MAP Gateway device that Administrators may download. The Audit Log will be stored in non-volatile memory so that it persists on device restarts. Audit Log messages will include data/time stamp, current user, current device name and address (commands only), and commanded value (commands only).

xii. Tailored Summary: Provides the ability to set up a custom summary tailored to the specific needs of the operator and the capabilities of the connected equipment. Tailored summaries can aggregate and display information from multiple controllers on a field bus.

xiii. Live Trend: Provides users with the ability to specify up to 3 points from a controller to trend in near real-time. The user shall have the ability to choose the sample interval and the total time covered in the display (x-axis). The system will create an appropriate y-axis automatically. Each trended variable shall be identified by unique color and symbol.

xiv. Airflow Balancing: The gateway shall provide a tool for VAV box commissioning and air balancing for controllers provided under this specification. Connectivity to the individual boxes will not require connection to each controller but rather a connection to a single device on the MS/TP network within WiFi range.

xv. Report Creation: It shall be possible to create reports that summarize system status and setpoints and to forward those reports to a central repository for the creation of as-built summaries or commissioning documents.

o. RS-485 connectivity and connections.

- i. The MAP Gateway shall include an RS-485 Port configured as BACnet MS/TP Master. Communications with devices and field controllers shall be possible via the following modes; all of these connections will provide access to all controllers on the MS/TP Field Controller bus:
 - Connecting to a Smart Equipment Controller through the Sensor-Actuator Bus (SA Bus) RJ12 jack.
 - Connecting to a field controller through the field controller SA Bus RJ12 jack.
 - Connecting to the SA Bus of the field controller from a network room sensor via the RJ12 jack on the network room sensor.
 - Connecting directly to the field controller bus, using an RJ12 to Terminal Block adaptor.
- ii. The MAP Gateway power may be supplied via the SA Bus, the field controller bus, or a micro USB port.

p. USB connection: The MAP Gateway shall include a USB Port to provide access to MAP web pages through the USB port for stationary user interface configurations or USB connected equipment:

- i. The USB port will follow USB 2.0 Network Device Profile.
- ii. Network Profile will have similar security requirements to Ethernet Port with fixed IP Ports but no AES Encryption.

q. Multi-Client access: The MAP Gateway shall provide multi-client connectivity for up to three (3) simultaneous users, and shall provide three (3) password protected User Roles with automatic LOGOUT after 30 minutes of inactivity.

r. Security: In order to provide greater security for the enterprise-wide BMS, the MAP Gateway shall provide a user interface for interacting with the BMS without connecting to the enterprise-wide BMS. The Wi-Fi Port shall provide WPA2 Security with AES 128 Bit Encryption:

- i. AP Only Operation or Client Mode to connect to other Wi-Fi networks.
- ii. The MAP Gateway shall provide a WiFi to Ethernet Pass-thru option; this option shall be disabled by default.
- iii. The MAP Gateway shall provide an option to disable the built-in Wi-Fi; this option shall only be available when the Ethernet connection is enabled.
- iv. When connected to an enterprise or BMS specific IT infrastructure, the MAP Gateway shall be designed and connected for use inside of a firewall.
- v. The MAP Gateway shall provide Authentication/Authorization.
- vi. The MAP Gateway shall be certified as penetration tested by a professional agency that specializes in penetration testing for IT appliances and devices.

s. Navigation: the MAP Gateway pages shall be derived from the respective HVAC equipment model and/or standard HVAC control application. The pages use and support HTML5 navigation practices, such as click to select, slide over/down.

t. Installation and status indicators:

- i. The MAP Gateway shall be designed to work as a portable device or it may be permanently mounted on site.
- ii. Portable: The MAP Gateway shall include a preconfigured, flexible coiled RJ-12 Cable to connect in the field directly to controllers or through wall mounted room sensors with an RJ-12 port. The MAP Gateway shall include a protective Rubber Bumper Guard and a Lanyard.
- iii. Stationary: The MAP Gateway shall include a Stationary Mounting Cradle to install the device in a panel. RJ-12 Cable, and an auto-switching 90-230 VAC Power Supply.
- iv. Status Indication: The MAP Gateway shall provide LED lights to indicate overall operating condition and status, communications for the MS/TP bus connection, communications via the Ethernet connection, and WiFi connection and signal strength.

u. MAP Gateway web page configuration and linking:

- i. The MAP Gateway shall provide automatic BACnet MS/TP device detection and connection, and automatic web page configuration and point linking.
 - Carrying case.
 - Spare battery.
 - External power supply/battery charger.
- ii. Software:
 - Portable operator terminals shall support all controllers within the system on a direct-connect communications basis.
 - When used to access First or Second Tier controllers, the portable operator terminal shall utilize the standard operator workstation software, as previously defined.
 - When used to access Application Specific Controllers, the portable operator terminal shall utilize either the standard operator workstation software, as previously defined, or controller-specific utility software.
- iii. Proprietary Portable Terminal:
 - Manufacturers providing proprietary portable terminals shall submit technical data sheets for the terminal and all associated software and hardware.

v. Provide Johnson Controls MAP Gateway or approved equal.

2.D Network Automation Engines

1. General
 - a. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.
 - b. Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.
 - c. User Interface – Each NAE shall have the ability to deliver a web based User Interface using the Site Management Portal functionality previously described. All computers connected physically or virtually to the automation network shall have access to the web based user interface.
 - i. The web based user interface software shall be embedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
 - ii. The NAE shall support a minimum of two (2) concurrent users.
 - iii. The web-based user shall have the capability to access all system data through a single NAE.
 - iv. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
 - v. Systems that require the user to address more than one NAE to access all system information are not acceptable.
 - vi. The NAE shall have the capability of generating web based user interface graphics. The graphics capability shall be embedded in the NAE.
 - vii. Systems that only support user interface graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
 - viii. The web based user interface shall support the following functions using a standard version of Microsoft Internet Explorer:
 - Configuration
 - Commissioning
 - Data Archiving
 - Monitoring
 - Commanding
 - System Diagnostics
 - ix. Systems that require workstation software or modified web browsers for system queries are not acceptable.
 - x. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

- d. Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
- e. Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
- f. User Authentication – The NAE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).
- g. Password Security – Access to the embedded user interface shall require a password of 8 to 50 characters including a minimum of one lower case letter, one upper case letter, one number, and one special character. An alarm shall be generated after three unsuccessful attempts within 15 minutes and the user shall be denied access until permission is renewed by a system administrator.
- h. Network Security – Communication between the NAE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.
- i. Hardware Real Time Clock – The NAE shall include an integrated, hardware-Based, real-time clock.
- j. Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
- k. Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
 - i. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
 - ii. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
- l. Certification – The NAE shall be listed by UL.
- m. Controller network – The NAE shall selectively support the following communication protocols on the controller network:
- n. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

- The NAE shall support Remote field bus integration via a BACnet IP to MS/TP router.
- The NAE shall be BTL certified and carry the BTL Label.
- The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
- A BACnet Protocol Implementation Conformance Statement shall be provided for the NAE.
- The Conformance Statements shall be submitted 10 days prior to bidding.

iii. The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.

- All LonWorks controls devices shall be LonMark® certified.

2. Network Automation Engine – Standard

a. The NAE shall support a minimum of:

- i. Fifty (50) BACnet Standard MS/TP controllers.
- ii. Sixty-four (64) LonWorks FTT10 Free Topology control devices.
- iii. Fifty (50) N2 control devices.

b. The NAE shall include troubleshooting LED indicators to identify the following conditions:

- i. Power – On/Off.
- ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.
- iii. Ethernet Connection Speed – 10 Mbps/100 Mbps.
- iv. FC Bus – Normal Communications/No Field Communications.
- v. Peer Communication – Data Traffic between NAE Devices.
- vi. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.
- vii. Bat Fault – Battery Defective, Data Protection Battery Not Installed.
- viii. Fault – General Fault.
- ix. Modem RX – NAE Modem Receiving Data (as required).
- x. Modem TX – NAE Modem Transmitting Data (as required).

c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals:

- i. USB port.
- ii. RS-232 serial data communication port.
- iii. RS-485 port.
- iv. Ethernet port.

a. The NAE shall support a minimum of:

- i. One Hundred (100) BACnet Standard MS/TP controllers.
- ii. One Hundred Twenty Seven (127) LonWorks FTT10 Free Topology control devices.
- iii. One Hundred (100) N2 control devices.
- b. The NAE shall include troubleshooting LED indicators to identify the following conditions:
 - i. Power – On/Off.
 - ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.
 - iii. Ethernet Connection Speed – 10 Mbps/100 Mbps.
 - iv. FC Bus – Normal Communications/No Field Communications.
 - v. Peer Communication – Data Traffic between NAE Devices.
 - vi. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.
 - vii. Bat Fault – Battery Defective, Data Protection Battery Not Installed.
 - viii. Fault – General Fault.
 - ix. Modem RX – NAE Modem Receiving Data (as required).
 - x. Modem TX – NAE Modem Transmitting Data (as required).
- c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.
 - i. USB port.
 - ii. RS-232 serial data communication port.
 - iii. RS-485 port.
 - iv. Ethernet port.
- d. Provide Johnson Controls NAE-45XX or approved equal as indicated on plans.

2.E DDC System Controllers

3. Field Equipment Controller
 - a. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol or optionally via N2Open.
 - i. The FEC shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.
 - The FEC shall be BTL certified and carry the BTL Label.
 - The FEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
 - A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.
 - The Conformance Statement shall be submitted 10 days prior to bidding.

- b. The FEC shall employ finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
- c. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
- d. The FEC shall include troubleshooting LED indicators to identify the following conditions:
 - i. Power On.
 - ii. Power Off.
 - iii. Download or Startup in progress, not ready for normal operation.
 - iv. No Faults.
 - v. Device Fault.
 - vi. Field Controller Bus – Normal Data Transmission.
 - vii. Field Controller Bus – No Data Transmission.
 - viii. Field Controller Bus – No Communication.
 - ix. SA Bus – Normal Data Transmission.
 - x. SA Bus – No Data Transmission.
 - xi. SA Bus – No Communication.
- e. The FEC shall accommodate the direct wiring of analog and binary I/O field points with the following minimum A/D and D/A conversion resolution.
 - i. Provide a minimum 15 bit A/D resolution for analog inputs.
 - ii. Provide a minimum 15 bit D/A resolution for analog outputs.
- f. The FEC shall support the following types of inputs and outputs:
 - i. Universal Inputs – shall be configured to monitor any of the following:
 - Analog Input, Voltage Mode.
 - Analog Input, Current Mode.
 - Analog Input, Resistive Mode.
 - Binary Input, Dry Contact Maintained Mode.
 - Binary Input, Pulse Counter Mode.
 - ii. Binary Inputs – shall be configured to monitor either of the following:
 - Dry Contact Maintained Mode.
 - Pulse Counter Mode.

- g. The FEC shall have the ability to monitor and control a network of sensors and actuators over a SA Bus.
 - i. The SA Bus shall be a MS/TP Bus supporting BACnet Standard Protocol SSPC-135.
 - ii. The SA Bus shall support a minimum of 10 devices per trunk.
 - iii. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.
- h. The FEC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.
 - i. The FEC shall support, but not be limited to, the following applications. Heating central plant applications.
 - iv. Built-up air handling units for special applications.
 - v. Terminal & package units.
 - vi. Special programs as required for systems control.
 - ii. The FEC shall support a Local Controller Display either as an integral part of the FEC or as a remote device communicating over the SA Bus.
 - i. The Display shall use a BACnet Standard SSPC-135 MS/TP protocol.
 - ii. The Display shall allow the user to view monitored points without logging into the system.
 - iii. The Display shall allow the user to view and change setpoints, modes of operation, and parameters.
 - iv. The Display shall provide password protection with user adjustable password timeout.
 - v. The Display shall be menu driven with separate paths for:
 - Input/Output.
 - Parameter/Setpoint.
 - Overrides.
 - vi. The Display shall use easy-to-read English text messages.
 - vii. The Display shall allow the user to select the points to be shown and in what order.
 - viii. The Display shall support a back lit LCD with adjustable contrast and brightens and automatic backlight brightening during user interaction.
 - ix. The display shall be a minimum of 4 lines and a minimum of 20 characters per line.
 - x. The Display shall have a keypad with no more than 6 keys.
 - xi. The Display shall be panel mountable.

- j. Provide Johnson Controls FEC or approved equal as shown on plans.

2. Field Devices:

- k. The network thermostat shall provide the flexibility to support any one of the following outputs:
 - i. Up to two cooling/heating stages.
 - ii. The network thermostat shall provide 4 digit passcode security.
- l. The network thermostat shall provide the flexibility to adjust the following control parameters:
- m. The network thermostat shall employ nonvolatile electrically EEPROM for all adjustable parameters.
- n. The network thermostat shall have a temperature accuracy of $\pm 0.9^{\circ}\text{F}/\pm 0.5^{\circ}\text{C}$ at $70.0^{\circ}\text{F}/21.0^{\circ}\text{C}$ typical calibrated.
- o. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral Passive Infra-Red (PIR) occupancy sensor model.
- p. The network thermostat shall provide user equipment visibility from a mobile device through the MAP.
- q. Provide Johnson Controls TEC363x or approved equal as indicated on plans.

4. Standalone Thermostat – Fan Coil and Zoning

- a. The standalone thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV system, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.
- b. The standalone thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.
 - i. Home screen configurable icons include:
 - On/Off icon, Fan override icon.
 - Zone/Hold temperature icon.
 - Zone humidity (on applicable models) icon.
 - Occupancy status (on applicable models) icon.
 - Temperature setpoint icon.
 - Alarm/Unit status/Date and Time and Fan Override icon.
 - Home screen non-configurable icon includes: Menu icon.
- c. The standalone thermostat shall provide the flexibility to support any one of the following inputs:
 - i. Integral indoor air temperature sensor.
 - ii. Analog input for remote air temperature sensing that supports the following sensor types:
 - Nickel.

- Platinum.
- A99B PENN.
- 2.25k ohm NTC.
- 10k ohm NTC.
- 10k ohm NTC Type 3.

iii. Universal input that supports the following configurations.

- Analog sensor.
- Cooling/heating when switch is closed.

iv. Remote indoor air temperature sensor

v. Two configurable binary inputs with the following configurations.

- Disabled, Occupancy, Override Dirty filter, Service, Fan lock open door/window

d. The standalone thermostat shall provide 4 digit passcode security.

e. The standalone thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

f. The standalone thermostat shall have a temperature accuracy of $\pm 0.9\text{F}^{\circ}/\pm 0.5\text{C}^{\circ}$ at $70.0\text{F}/21.0\text{C}$ typical calibrated.

g. The standalone thermostat shall have a humidity accuracy of $\pm 5\%$ RH from 20 to 80% RH at 50 to 90F (10 to 32C .)

h. On/Off or Floating fan coil and zoning applications.

i. The standalone thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

ii. The standalone thermostat shall provide the flexibility to support any one of the following valve outputs:

- Two on/off and two floating

iii. The standalone thermostat shall provide the flexibility to adjust the following control parameters:

i. Proportional fan coil and zoning applications

i. The standalone thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

ii. The standalone thermostat shall provide the flexibility to support the following valve outputs:

- Two proportional configurable from 0 to 10V.

- iii. The standalone thermostat shall provide the flexibility to adjust the following control parameters:
 - j. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral Passive Infra-Red (PIR) occupancy sensor with a field of 94 angular degrees up to a distance of 15 ft., clear line of sight.
 - k. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral relative humidity sensor.
- 5. Standalone Thermostat – RTU/heat pump with economizer
 - a. The standalone thermostat shall be capable of controlling the following types of split or packaged units:
 - Cooling only units.
 - Cooling only units with gas or electric heat.
 - Heat pumps.
 - Units with economizers.
 - b. The standalone thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.
 - iv. Home screen non-configurable icon includes:
 - Menu icon.
 - c. The standalone thermostat shall provide the flexibility to support any one of the following inputs:
 - i. Integral indoor air temperature sensor.
 - ii. Analog input for remote air temperature sensing that supports the following sensor types:
 - Nickel.
 - Platinum.
 - A99B PENN.
 - 2.25k ohm NTC.
 - 10k ohm NTC.
 - 10k ohm NTC Type 3.
 - iii. Remote indoor air temperature sensor.
 - iv. Analog input for outdoor air temperature sensor.
 - v. Analog input for remote temperature monitoring.
 - vi. Two configurable binary inputs.
 - d. The standalone thermostat shall provide the flexibility to support the following outputs:
 - i. Up to two cooling/heating stages.
 - e. The standalone thermostat shall provide 4 digit passcode security.

- f. The standalone thermostat shall provide the flexibility to adjust the following control parameters:
 - i. Adjustable compressor minimum on time from 0 to 360 seconds.
- g. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral Passive Infra-Red (PIR) occupancy sensor model.
- h. The standalone thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.
- i. The standalone thermostat shall have a temperature accuracy of $\pm 0.9^{\circ}\text{F}/\pm 0.5^{\circ}\text{C}$ at $70.0^{\circ}\text{F}/21.0^{\circ}\text{C}$ typical calibrated.
- j. Proportional fan coil and zoning applications.
 - i. The network thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV system, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.
 - ii. The network thermostat shall provide the flexibility to support any one of the following fan outputs:
 - Three speed fan control.
 - Proportional speed fan control configurable from 0 to 10V.
 - iii. The network thermostat shall provide the flexibility to support the following valve outputs:
 - Two proportional configurable from 0 to 10V.
 - iv. The network thermostat shall provide the flexibility to adjust the following control parameters:
 - Adjustable maximum setpoint offset from 0 to 20°F .
 - Adjustable fan on delay from 0 to 120 seconds.
- k. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.
- l. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral relative humidity sensor.

6. Network Sensors
 - a. The Network Sensors (NS) shall have the ability to monitor the following variables as required by the systems sequence of operations:
 - i. Zone Temp, Humidity, Setpoint, Discharge air temp and CO2
 - ii. The NS shall transmit the information back to the controller on the SA Bus using BACnet Standard protocol SSPC-135.
 - b. The NS shall be BTL certified and carry the BTL Label.
 - i. The NS shall be tested and certified as a BACnet Smart Sensors (B-SS).

- ii. A BACnet Protocol Implementation Conformance Statement shall be provided for the NS.
- iii. The Conformance Statement shall be submitted 10 days prior to bidding.

2.F System Tools

- 1. System Configuration Tool
 - a. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE) or a Network Integration Engine (NIE).
 - b. The configuration tool shall provide an archive database for the configuration and application data.
 - c. The configuration tool shall have the same look-and-feel at the Site Management Portal user interface regardless of whether device configuration is being done online or offline.
 - d. The configuration tool shall include the following features:
 - i. Basic system navigation tree for connected networks.
 - ii. Integration of Johnson Controls N1, LonWorks, and BACnet enabled devices.
 - iii. Customized user navigation trees.
 - iv. Point naming operating parameter setting.
 - v. Graphic diagram configuration.
 - vi. Alarm and event message routing.
 - vii. Graphical logic connector tool for custom programming.
 - viii. Downloading, uploading, and archiving databases.
 - e. The configuration tool shall provide a site discovery feature to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
 - i. BACnet Devices.
 - ii. LonWorks devices.
 - iii. Johnson Controls N2 Bus devices.
 - iv. Johnson Controls Metasys N1 networks.
 - f. The configuration tool shall be capable of programming the Field Equipment Controllers.
 - i. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
 - ii. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
 - iii. The configuration tool shall contain a library of standard applications to be used for configuration.

- g. The configuration tool shall be capable of programming the field devices.
 - iv. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
 - v. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
 - vi. The configuration tool shall contain a library of standard applications to be used for configuration. Provide Johnson Controls SCT or approved equal.

2.G Computing Hardware and Software

1. General
 - a. Computing hardware, software and operating systems shall be provided at the revision level or model number as specified or at the latest release of the vendor if not specified.
 - b. In order to provide a consistent level of performance, all PCs shall be provided with Operating Systems and Processors by the manufacturer specified.
2. Dedicated Web Based User Interface
 - a. PC Hardware – The personal computer(s) shall be configured as follows:
 - i. Memory – 16 GB (8 GB Minimum.)
 - ii. CPU – Intel Quad Core processor. 3.2 GHz Clock Speed (minimum.)
 - iii. Hard Drive – 500 GB hard drive capacity.
 - iv. Hard drive backup system – CD/RW, DVD/RW or network backup software provided by owners IT department.
 - v. Ports – (2) USB 3.0, Ethernet, VGA, microphone/headset.
 - vi. Keyboard – 101 Keyboard and 2 Button Mouse.
 - vii. Display configuration – 1-2 displays as follows:
 - Each Display – 24" LED Flat Panel Monitor 1920 x 1080 resolution minimum.
 - 16 bit or higher color resolution.
 - Display card with multiple monitor support.
 - b. Operating System Software
 - i. Windows 10 Professional or Enterprise Edition with Ann. Update (64 bit.)
 - ii. Provide complete operator workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
 - iii. Provide software registration cards to the Owner for all included software.
 - c. Peripheral Hardware
 - i. Reports printer (Dedicated):
 - Printer Make – Hewlett Packard DeskJet.

- Print Speed – 600 DPI Black, 300 DPI Color.
- Buffer – 64 K Input Print Buffer (minimum.)

3. Application and Data Server

- a. PC Hardware – The personal computer shall be configured as follows:
 - i. Memory – 8 GB.
 - ii. CPU – Intel Dual Core processor. 2.8 GHz Clock Speed (minimum.)
 - iii. Hard Drive – 240 GB free hard drive space after program installation.
 - iv. Hard Drive Backup – DVD/RW or 500 GB portable back-up drive.
 - v. Ports: (2) USB 3.0, VGA, HDMI 1920x1080 resolution, Ethernet – 10/100/1000.
 - vi. User Interface:
 - 101 key full size QWERTY Keyboard with number pad.
 - Two (2) Button LED mouse.
 - LED flat panel 24 in. monitor with wide screen full HD resolution.
- b. Software/Operating System Requirements
 - i. Windows 10 Pro or Windows 10 Enterprise Editions with Anniversary Update (version 1607) (64-bit.)
 - ii. SQL 2014 Express SP3 (64-bit.)
 - iii. Microsoft Office Professional.
 - iv. BMS supplier-specific programs and files required for described functionality.
 - v. BMS supplier-specific programs and files required for described functionality.

4. Local Control Panels

- a. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508A label listing compliance. Control panels shall be fully enclosed, with sub-panel, hinged door, and flush latch.
- b. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
- c. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
- d. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
- e. All wiring shall be neatly installed in plastic trays or tie-wrapped.

- f. Control panels for use in seismic areas shall be built in an approved facility and carry the appropriate label.
- g. Except where otherwise noted, all standard and custom control panels shall be built in an ISO9002 certified facility.

5. Power Supplies

- a. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
- b. Input: 120 VAC +10%, 60Hz.
- c. Output: 24 VDC.
- d. Line Regulation: +0.05% for 10% line change.
- e. Load Regulation: +0.05% for 50% load change.
- f. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
- g. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
- h. A power disconnect switch shall be provided next to the power supply.

Part 3 – Performance/Execution

3.A BMS Specific Requirements

1. Graphic Displays
 - a. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
2. Custom Reports:
 - a. Provide custom reports as required for this project.

3.B Installation Practices

1. BMS Wiring
 - a. All conduit, wiring, accessories and wiring connections required for the installation of the BMS, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 24 Electrical. All wiring shall comply with the requirements of applicable portions of Division 24 and all local and national electric codes, unless specified otherwise in this section.
 - b. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
 - c. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
 - d. Class 2 Wiring

- i. All Class 2 (24 VAC or less) wiring shall be installed in conduit unless otherwise specified.
- ii. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
- e. Class 2 signal wiring and 24 VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
- f. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

2. BMS Line Voltage Power Source
 - a. 120-volt AC circuits used for the BMS shall be taken from panel boards and circuit breakers provided by Division 24.
 - b. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
 - c. DDC terminal unit controllers may use AC power from motor power circuits.
3. BMS Raceway
 - a. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
 - b. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
 - c. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
 - d. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
4. Penetrations
 - a. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
 - b. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
 - c. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
 - d. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
5. BMS Identification Standards

- a. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
- b. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.
6. BMS Panel Installation
 - a. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
 - b. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
7. Input Devices
 - a. All Input devices shall be installed per the manufacturer recommendation.
 - b. Locate components of the BMS in accessible local control panels wherever possible.
8. HVAC Input Devices – General
 - a. All Input devices shall be installed per the manufacturer recommendation.
 - b. Locate components of the BMS in accessible local control panels wherever possible.
 - c. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
 - d. Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.
 - e. Outside Air Sensors
 - i. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outdoor air conditions accurately.
 - ii. Sensors shall be installed with a rain proof, perforated cover.
 - f. Water Differential Pressure Sensors
 - i. Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device.
 - ii. Differential pressure transmitters shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines.
 - iii. The transmitters shall be installed in an accessible location wherever possible.
 - g. Medium to High Differential Water Pressure Applications (Over 21" WC)
 - i. Air bleed units, bypass valves and compression fittings shall be provided.
 - h. Building Differential Air Pressure Applications (-1" to +1" WC)
 - i. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
 - ii. The interior tip shall be inconspicuous and located as shown on the drawings.

- i. Air Flow Measuring Stations
 - i. Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct.
 - ii. Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.
- j. Duct Temperature Sensors
 - i. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
 - ii. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
 - iii. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
 - iv. The sensor shall be mounted to suitable supports using factory approved element holders.
- k. Space Sensors
 - i. Shall be mounted per ADA requirements.
 - ii. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
- l. Low Temperature Limit Switches
 - i. Install on the discharge side of the first water or steam coil in the air stream.
 - ii. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
 - iii. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
- m. Air Differential Pressure Status Switches
 - i. Install with static pressure tips, tubing, fittings, and air filter.
- n. Water Differential Pressure Status Switches
 - i. Install with shut off valves for isolation.
- o. HVAC Output Devices
 - i. All output devices shall be installed per the manufacturers' recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.
 - ii. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.

- iii. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
- iv. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.
- v. Electronic Signal Isolation Transducers: Whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems.

3.C Training

3.D The BMS contractor shall provide the following training services:

- a. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.E Commissioning Requirements

- 1. Fully commission all aspects of the BMS work.
- b. The BMS Contractor shall issue a report based on a sampling of the VAV calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.
- c. Promptly rectify all listed deficiencies and submit a document summarizing completion to the Engineer.

23 09 93 Sequence of Operation for HVAC Controls**Part 1 – Sequence of Operation****1.A Sequence of Operation****SUPPLY FAN CONTROL:**

Upon a start command the isolation damper(s) will open. When open status is achieved, the variable speed supply fan (SF-C) will be started based on occupancy. After the start command is sent (SF-C), the outside air damper will open, and the unit will start when the damper end switch has proven open status. When the supply fan status (SF-S) indicates the fan started, the control sequence will be enabled. The supply fan (SF-O) will modulate to maintain the discharge static pressure (DA1-P) at setpoint (DAP-SP). Upon a loss of airflow (SF-C), the supply fan will attempt to automatically restart until positive status is received. .

TEMPERATURE CONTROL:

The unit will control to maintain a constant discharge air temperature (DA-T).

OCCUPIED MODE:

The occupancy mode will be controlled via a network input (OCC-SCHEDULE). The occupancy mode can also be overridden by a network input (OCC-OVERRIDE).

UNOCCUPIED MODE:

The unit will remain off during unoccupied periods.

COOLING COIL:

The cooling coil (CLG-O) will modulate to maintain the discharge air temperature setpoint (DAT-SP). When the unit is shutdown, the cooling coil will be commanded to a preset position should the outdoor air temperature (OA-T) fall below the low outdoor air temperature setpoint (OALT-SP). Upon a loss of airflow (SF-S), the cooling coil will be off.

REHEAT COIL:

The reheat coil (HTGx-C) will be staged in sequence to maintain the discharge air temperature setpoint (DAT-SP).

UNIT PROTECTION:

- Low Temperature Alarm (LT-A) - When in "Alarm", the control sequence will stop running, the valve(s) will open and the fan(s) will be disabled via a hard wired shutdown circuit.
- Discharge Air Smoke Detector (DA-SD) - Disables the fan(s) via a hard wired shutdown circuit.

ADDITIONAL POINTS MONITORED BY THE FMS:

- Zone Temperature (ZN-T)
- Zone Humidity (ZN-H)
- Final Filter Differential Pressure (FFILT-DP)
- Discharge Air Smoke Alarm (DA-SD)

- Supply Fan Motor Speed (SF-RPM)

Part 2 – Points list

2.A Point Lists in addition to BACnet Provided Outside Air Unit points

OAU- 1,2,3

Name	Description
CLG-O	Cooling Output
DA-SD	Discharge Air Smoke Alarm
DA-T	Discharge Air Temperature
DA1-P	Discharge Air Static Pressure 1
FFILT-DP	Final Filter Differential Pressure
HTG1-C	Heating Stage 1 Command
LT-A	Low Temperature Alarm
OCC-MODE	Occupancy Status Display
SF-C	Supply Fan Command
SF-O	Supply Fan Output
SF-RPM	Supply Fan Motor Speed
SF-S	Supply Fan Status
ZN-H	Zone Humidity
ZN-T	Zone Temperature

VRF Units: 1st and 2nd Floor

2.B Point from BACnet Provided by VRF Front Control Panel/Controller

Exhaust Fans: Ref Plan Schedules for BAS control/sequence

Mini-Splits: Ref Plan Schedules for BAS control/sequence

End of Section

SECTION 23 23 00**REFRIGERANT PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 05 01: Common HVAC Requirements.
 - 2. Section 23 07 19: Refrigerant Piping Insulation.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A 36-05, 'Standard Specification for Carbon Structural Steel.'
 - b. ASTM B 280-05, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.'
 - 2. American Welding Society / American National Standards Institute:
 - a. AWS / ANSI A5.8-2004, 'Specification for Brazing Filler Metal.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings: Show each individual equipment and piping support.
- B. Informational Submittals:
 - 1. Qualification Statements: Technician certificate for use of CFC and HCFC refrigerants.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer: Refrigerant piping shall be installed by a refrigeration subcontractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Emerson Climate Technologies, St Louis, MO www.emersonflowcontrols.com.
 - b. Cush-A-Clamp by ZSI Manufacturing, Canton, MI www.cushaclamp.com.
 - c. Elkhart Products Corp, Elkhart, IN www.elkhartproducts.com.
 - d. Handy & Harman Products Division, Fairfield, CT www.handy-1.com.
 - e. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - f. Henry Valve Co, Melrose Park, IL www.henrytech.com.

- g. Hilti Inc, Tulsa, OK www.hilti.com.
- h. Hydra-Zorb Co, Auburn Hills, MI www.hydra-zorb.com.
- i. Mueller Steam Specialty, St Pauls, NC www.muellersteam.com.
- j. Nibco Inc, Elkhart, IN www.nibco.com.
- k. Packless Industries, Waco, TX www.packless.com.
- l. Parker Corp, Cleveland, OH www.parker.com.
- m. Sporlan Valve Co, Washington, MO www.sporlan.com.
- n. Sherwood Valves, Washington, PA www.sherwoodvalve.com.
- o. Thomas & Betts, Memphis, TN www.superstrut.com.
- p. Unistrut Corp, Wayne, MI www.unistrut.com.
- q. Universal Metal Hose, Chicago, IL www.universalmetalhose.com.
- r. Vibration Mountings & Controls, Bloomingdale, NJ www.vmc-kdc.com.
- s. Virginia KMP Corp, Dallas, TX www.virginiakmp.com.

B. Materials:

- 1. Refrigerant Piping:
 - a. Meet requirements of ASTM B 280, hard drawn straight lengths. Soft copper tubing not permitted.
 - b. Do not use pre-charged refrigerant lines.
- 2. Refrigerant Fittings:
 - a. Wrought copper with long radius elbows.
 - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - 1) Mueller Streamline.
 - 2) Nibco Inc.
 - 3) Elkhart.
- 3. Suction Line Traps:
 - a. Manufactured standard one-piece traps.
 - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - 1) Mueller Streamline.
 - 2) Nibco Inc.
 - 3) Elkhart.
- 4. Connection Material:
 - a. Brazing Rods in accordance with ANSI / AWS A5.8:
 - 1) Copper to Copper Connections:
 - a) Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - b) Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - b. Flux:
 - 1) Type Two Acceptable Products:
 - a) Stay-Silv White Brazing Flux by Harris Products Group.
 - b) High quality silver solder flux by Handy & Harmon.
 - c) Equal as approved by Architect before use. See Section 01 6200.
- 5. Valves:
 - a. Expansion Valves:
 - 1) For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
 - 2) Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
 - 3) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a) Emerson Climate Technologies.
 - b) Henry.
 - c) Mueller.
 - d) Parker.
 - e) Sporlan.
 - b. Manual Refrigerant Shut-Off Valves:
 - 1) Ball valves designed for refrigeration service and full line size.
 - 2) Valve shall have cap seals.

- 3) Valves with hand wheels are not acceptable.
- 4) Provide service valve on each liquid and suction line at compressor.
- 5) If service valves come as integral part of condensing unit, additional service valves shall not be required.
- 6) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a) Henry.
 - b) Mueller.
 - c) Sherwood.
 - d) Virginia.
6. Filter-Drier:
 - a. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
 - b. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.
 - c. Size shall be full line size.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - 1) Emerson Climate Technologies.
 - 2) Mueller.
 - 3) Parker.
 - 4) Sporlan.
 - 5) Virginia.
7. Sight Glass:
 - a. Combination moisture and liquid indicator with protection cap.
 - b. Sight glass shall be full line size.
 - c. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
 - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 - 1) HMI by Emerson Climate Technologies.
8. Flexible Connectors:
 - a. Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Vibration Absorber Model VAF by Packless Industries.
 - 2) Vibration Absorbers by Virginia KMP Corp.
 - 3) Anaconda 'Vibration Eliminators' by Universal Metal Hose.
 - 4) Style 'BF' Spring-flex freon connectors by Vibration Mountings.
9. Refrigerant Piping Supports:
 - a. Base, Angles, And Uprights: Steel meeting requirements of ASTM A 36.
 - b. Securing Channels:
 - 1) At Free-Standing Pipe Support:
 - a) Class One Quality Standard: P-1000 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 2) At Wall Support:
 - a) Class One Quality Standard: P-3300 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 3) At Suspended Support:
 - a) Class One Quality Standard: P-1001 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 4) Angle Fittings:
 - a) Class One Quality Standard: P-2626 90 degree angle by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - c. Pipe Clamps:
 - 1) Type Two Acceptable Manufacturers:
 - a) Hydra-Zorb.
 - b) ZSI Cush-A-Clamp.
 - c) Hilti Cush-A-Clamp.

- d) Equal as approved by Architect before installation. See Section 01 6200.
- d. Protective Cover: 18 ga steel, hot-dipped galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refrigerant Lines:
 - 1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.
 - 2. Slope suction lines down toward compressor **one inch/10 feet 25 mm in 3 meters**. Locate traps at vertical rises against flow in suction lines.
- B. Connections:
 - 1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
 - 2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
 - 3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.
- C. Specialties:
 - 1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
 - 2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
 - 3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
 - 4. Provide flexible connectors in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons. Anchor pipe near each flexible connector.
- D. Refrigerant Supports:
 - 1. Support Spacing:
 - a. Piping 1-1/4 inch And Larger: 8 feet on center maximum.
 - b. Piping 1-1/8 inch And Smaller: 6 feet on center maximum.
 - c. Support each elbow.
 - 2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
 - 3. Run protective cover continuous from condensing units to risers or penetrations at building wall.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
 - a. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.
 - b. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.
 - c. Conduct tests at 70 deg F ambient temperature minimum.
 - d. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
 - e. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
 - f. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.

2. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

END OF SECTION

SECTION 23 26 00**CONDENSATE DRAIN PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install condensate drain piping as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 05 01: Common HVAC Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Materials:
 - 1. Condensate Drains:
 - a. Exterior And Interior Lines: Type M copper meeting requirements of ASTM B 88.
 - b. Interior Lines Only: Schedule 40 PVC.
- B. Condensate Pump:
 - 1. Rated at 225 gph at **15 feet** 4 500 mm total head. Complete with **one gallon** 3.8 liter polystyrene tank with pump and automatic float control. 1/5 hp, 120 V, one phase, 60 Hertz.
 - 2. Condensate piping shall be Type M copper or Schedule 40 PVC.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. No. CB501UL by Beckett Corp, Irving, TX www.beckettpumps.com.
 - b. No. VCL45ULS by Little Giant Pump Co, Oklahoma City, OK www.lgpc.com.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Condensate Drains:
 - 1. Support piping and protect from damage.
 - 2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.

END OF SECTION

SECTION 23 30 01**COMMON DUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General procedures and requirements for ductwork.
 - 2. Repair leaks in ductwork, as identified by duct testing, at no additional cost to Owner.
- B. Related Requirements:
 - 1. Section 01 43 16: Duct testing, adjusting, and balancing of ductwork.
 - 2. Section 07 92 19: Quality of acoustic sealant.
 - 3. Section 23 05 01: Common HVAC Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Specification data on sealer and gauze proposed for sealing ductwork.
 - 2. Samples: Sealer and gauze proposed for sealing ductwork.
- B. Informational Submittals:
 - 1. Manufacturer Instructions: Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.
- B. Materials:
 - 1. Duct Hangers:
 - a. One inch 25 mm by 18 ga 1.27 mm galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches 2 400 mm apart. Do not use wire hangers.
 - b. Attaching screws at trusses shall be 2 inch 50 mm No. 10 round head wood screws. Nails not allowed.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.
- B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.
- C. Hangers And Supports:
 1. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
 2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
 3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
 4. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
 5. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

3.2 CLEANING

- A. Clean interior of duct systems before final completion.

END OF SECTION

SECTION 23 31 11**HIGH PRESSURE DUCTWORK****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section specifies the construction of ductwork for the listed systems when the duct static pressure is greater than 2 inches W.C. Each duct system shall have a single pressure classification, which shall exceed to fan's external static rating listed in the equipment schedules. In cases where an external fan static is not given in the equipment schedules, the pressure classification of the duct system shall exceed the fan's total static rating.
- B. Provide ductwork and/or plenums for the following high pressure air systems:
 1. Supply air upstream of terminal boxes.
 2. Return air ductwork from air handling unit to combination fire smoke damper leaving shaft to serve the floor.
 3. .Return air/exhaust air ductwork upstream of air volume control devices.
- C. Include all turning vanes, volume dampers, duct access panels, wall and ceiling access panels, flexible connections, flexible duct, duct sealing systems, hangers and supports necessary to complete the indicated and specified system and achieve the desired system operation.

1.02 QUALITY ASSURANCE

- A. The listed standards are referenced for the contractor to follow for the construction of ductwork items not specifically addressed in this specification section. This specification takes precedence over the referenced standards.
- B. Standards:
 1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), National Fire Protection Association (NFPA), and Underwriters' Laboratories (UL).
 2. SMACNA "HVAC Duct Construction Standards Metal and Flexible" 1985 edition. Construct ductwork to meet all functional criteria defined in the 1985 SMACNA standards except where noted otherwise. Note: Duct constructions compliant with other editions of the SMACNA standards that do not meet or exceed the 1985 SMACNA standard are unacceptable.
 3. SMACNA "Round and Rectangular Industrial duct Construction Standards." This is to be used for return duct subject to negative pressures greater than 4 inches W.C. Construct ductwork to meet all functional criteria defined in the 1985 SMACNA standards except where noted otherwise. Note: Duct constructions compliant with other editions of the SMACNA standards that do not meet or exceed the 1985 SMACNA standard are unacceptable.
 4. SMACNA "HVAC Air Duct Leakage Test Manual" latest edition.
- C. All ductwork and fittings must have a computer generated label affixed to each section detailing all applicable information including the duct dimensions, gage, reinforcement type/class, and connector type of systems manufacturer. In addition, galvanizing thickness and country of origin must be clearly stenciled on each duct section.

D. The Engineer reserves the right to randomly check sheet metal gauges and reinforcing to verify all duct construction is in compliance. Non-conforming material will be replaced by the Contractor at no cost to the Owner.

1.03 SUBMITTALS

- A. Submit ductwork fabrication and layout shop drawings in accordance with Section 20 05 15, "Submittals." Coordinate the detailed fabrication drawings with all trades. Coordinate size and location of ductwork with structure, piping, lighting, equipment, conduit, bus ducts, ceiling construction and clear height above ceilings and other items which may present a potential conflict.
- B. Layout drawings shall be at 1/4 inch = 1 foot scale on reproducible media with enlarged sections, elevations, plan drawings, and mechanical room drawings as necessary to ensure a coordinated installation.
- C. Written program outlining protection of ductwork from contamination with dirt and procedures for cleaning contaminated ductwork.
- D. Submit documentation that the minimum two weeks building 100% outside air flush-out was completed, including dates when the flush-out was begun and completed and what steps were taken to guarantee 100% outside air usage.
- E. Submit documentation for the filtration media used during the flush-out period, including filtration media manufacturer's name, model number, and MERV value.
- F. Submit documentation that all filtration was replaced immediately, prior to occupancy including filtration media manufacturer's name, model number, and MERV value.
- G. Low Emitting Materials Documentation:
 1. Provide a cut sheet and a Material Safety Data Sheet for each adhesive used in the building highlighting compliance with Specification requirements.
 2. Provide a cut sheet and a Material Safety Data Sheet for each sealant used in the building highlighting compliance with Specification requirements.

1.04 DUCT DIMENSIONS

- A. The dimensions indicated on the contract drawings are the net inside clear dimensions available for airflow.
- B. Contractor shall allow for exterior insulation thickness as required and indicate this on the ductwork layout shop drawings.

PART 2 PRODUCTS

2.01 STEEL DUCTWORK

- A. Unless noted otherwise, all ducts shall be constructed with G-90 or better galvanized steel conforming to ASTM A653/A653M and A924/A924M Standards, Lock-Forming Quality (LFQ). Provide a factory-applied surface protection such as oil or a paint-grip on all galvanized steel to be used for ductwork that will be painted.
- B. Stainless steel ductwork shall be Type 304 stainless steel with a No. 2D finish in concealed locations and a No. 4 finish for exposed locations, conforming to ASTM A-167 and A-480.

2.02 RECTANGULAR DUCT

A. The following table indicates the minimum duct gauge based on largest dimension of the duct for fans with external static pressure over 2 inches W.G. up to 3 inches W.G. (Positive or Negative) - Return air ductwork from air handling unit to combination fire smoke damper leaving shaft to serve the floor.

DUCT DIMENSION	DUCT GAUGE WITHOUT REINFORCEMENT	DUCT GAUGE REINFORCED 4 FT ON CENTER	DUCT GAUGE REINFORCED 5 FT ON CENTER
12" or less	22	--	--
13" to 14"	20	24	24
15" to 18"	18	24	24
19" to 24"	16	24	24
25" to 26"	--	24	24
27" to 30"	--	24	22
31" to 36"	--	24	20
37" to 42"	--	22	20
43" to 48"	--	20	18
49" to 54"	--	18	18
55" to 60"	--	18	16
61" to 72"	--	16	--

1. Ducts with one dimension 73 inches to 120 inches shall be 18 gauge with reinforcement 2 feet on center. Reinforce all ducts having one dimension over 120 inches per SMACNA standards.
2. Duct reinforcement must be provided and spaced as indicated on all ducts with a dimension greater than 24 inches. All reinforcement shall meet SMACNA standards with regards to reinforcement style and rigidity. Reinforced ductwork gauges shall not be reduced from the minimums indicated in this specification. All reinforcement shall be galvanized steel.

B The following table indicates the minimum duct gauge based on largest dimension of the duct for fans with external static pressure up to 4 inches W.G. (Positive or Negative) - Ductwork from shaft combination fire smoke damper to terminal box.

DUCT DIMENSION	DUCT GAUGE WITHOUT REINFORCEMENT	DUCT GAUGE REINFORCED 4 FT ON CENTER	DUCT GAUGE REINFORCED 5 FT ON CENTER
10" or less	22	--	--
11" to 12"	20	24	24
13" to 16"	18	24	24
17" to 18"	16	24	24
19" to 22"	--	24	24
23" to 30"	--	24	22
31" to 36"	--	22	20
37" to 42"	--	20	18
43" to 48"	--	18	18
49" to 54"	--	18	16
55" to 60"	--	16	16

1. Ducts with one dimension 61 inches to 120 inches shall be 18 gauge with reinforcement 2 ft on center. Reinforce all ducts having one dimension over 120 inches per SMACNA standards.
2. Duct reinforcement must be provided and spaced as indicated on all ducts with a dimension greater than 18 inches. All reinforcement shall meet SMACNA standards with regards to reinforcement style

and rigidity. Reinforced ductwork gauges shall not be reduced from the minimums indicated in this specification. All reinforcement shall be galvanized steel.

C. The following table indicates the minimum duct gauge based on largest dimension of the duct for fans with external static pressure over 4 inches W.G. up to 6 inches W.G. (Positive or Negative) - From air handling unit to combination fire smoke damper leaving shaft to serve floor.

DUCT DIMENSION	DUCT GAUGE WITHOUT REINFORCEMENT	DUCT GAUGE REINFORCED 4 FT ON CENTER	DUCT GAUGE REINFORCED 5 FT ON CENTER
8" or less	22	--	--
9" to 10"	20	24	24
11" to 14"	18	24	22
15" to 16"	16	24	22
17" to 22"	--	24	22
23" to 24"	--	22	22
25" to 28"	--	22	20
29" to 30"	--	22	18
31" to 36"	--	20	18
37" to 42"	--	18	16
43" to 48"	--	18	--
49" to 54"	--	16	--

1. Ducts with one dimension 55 inches to 120 inches shall be 18 gauge with reinforcement 2 ft on center. Reinforce all ducts having one dimension over 120 inches per SMACNA standards.
2. Duct reinforcement must be provided and spaced as indicated on all ducts with a dimension greater than 16 inches. All reinforcement shall meet SMACNA standards with regards to reinforcement style and rigidity. Reinforced ductwork gauges shall not be reduced from the minimums indicated in this specification classification. All reinforcements shall be galvanized steel.

2.03 ROUND DUCT

A The following table indicates the minimum gauge for round supply ductwork for fans with external static pressure of up to 10 inches W.C.:

DUCT DIMENSION	SPIRAL SEAM GAUGE	LONGITUDINAL SEAM GAUGE	FITTING GAUGE
3" thru 14"	26	24	24
15" thru 26"	24	22	22
26" thru 36"	22	20	20
37 thru 50"	20	18	18
51 thru 60"	18	16	16
61" thru 84"	16	14	14

B. The following table indicates the minimum gauge for round ductwork for fans with negative external static pressure of up to minus 4 inches W.C.:

DUCT DIMENSION	SPIRAL SEAM GAUGE	LONGITUDINAL SEAM GAUGE	FITTING GAUGE
3" thru 14"	24	22	24
15" thru 26"	22	18	22
26" thru 36"	20	20*	20*
37 thru 48"	18	18*	18*
49" thru 60"	18*	16*	16*

*. Provide reinforcement rings or equivalent, per SMACNA Standards.

C Additional round duct construction requirements:

1. Seam construction shall be spiral seam up to 60 inches in diameter and continuous butt weld above 60 inches in diameter.
2. All fittings are to be continuously welded construction.
3. Round elbows shall be radius type with a centerline radius of 1.5 times the duct diameter.
4. Provide round opposed multiblade volume dampers in round ducts.

2.04 FLAT OVAL DUCT

A. The following table indicates the minimum gauge for flat oval supply ductwork:

MAJOR DIMENSION	SPIRAL SEAM GAUGE	LONGITUDINAL SEAM GAUGE	FITTING GAUGE
3" to 24"	24	20	20
25" to 36"	22	20	20
37" to 48"	22	18	18
49" to 60"	20	18	18
61" to 70"	20	16	16
71" to 84"	18	16	16

1. Provide duct reinforcement and tie rods for flat sides of ducts as per SMACNA standards without reduction of duct gauge according to the following:

FAN EXTERNAL STATIC	MAJOR DIMENSION ABOVE WHICH SPIRAL REINFORCEMENT IS REQUIRED
Over 2" up to 3"	24"
Over 3" up to 4"	18"
Over 4" up to 6"	16"
Over 6"	12"

2. All fittings are to be continuously welded construction, or spot welded and bonded

2.05. DUCT SEALS

A. Seal all duct transverse joints and longitudinal seams to meet SMACNA Seal Class A for 10 inches of static pressure as a minimum.

- B. Duct Sealant: Liquid seal for joints and seams. Surfaces are to be clean and free from oil, dust, dirt, rust, moisture, or any substance which would interfere with bonding of sealant. Where metal clearances exceed 1/16 inch, several applications are required.
 - 1. McGill AirSeal Corporation "United Duct Sealer – Water Based"
 - 2. Hardcast "Duct-Seal 321"
 - 3. Ductmate "Proseal"
 - 4. Products with documented VOC-emission rates meeting LEED guidelines by Dow Corning, Miracle Adhesives, Ductmate Industries, or Surebond, Inc.
- C. Soft elastomer butyl gasket with adhesive backing shall be used to seal flanged joints.

2.06 FIELD ERECTED CASING, PLENUMS AND MIXING BOXES

- A. Construct all casings and plenums to the pressure class equal to the fan's total pressure as indicated on the drawings. The casings shall be capable of handling both positive and negative pressures.
- B. Seal all pipe penetrations airtight. SECTION 23 31 11 HIGH PRESSURE DUCTWORK 13-HC1-033 23 31 11-7.
- C. Panel construction shall be galvanized steel.
- D. Drain pans shall be welded stainless steel and shall extend beyond the coil to catch all condensed water (extend a minimum of 6 inches beyond coil). For coils over 30 tall provide intermediate drain pans.
- E. Provide casing access doors with a minimum of two hinges and two latches. Provide access doors such that filters, dampers, motors, coils and control devices are accessible for service or removal. 1. Ventlock, Ruskin, or McGill AirPressure Corporation.
- F. Seal all joints, seams, penetrations, and connections on both suction and discharge sides of the fan in accordance with SMACNA Seal Class A for 10 inches of static pressure as a minimum. Provide gasketing on all doors and access panels.

2.07 FLEXIBLE DUCTWORK

- A. 5 feet is the maximum allowable length for connection to supply terminal boxes and laboratory air control supply terminals. Flexible ductwork shall not be used to connect return or exhaust air devices unless specifically indicated on Drawings.
- B. All flexible duct shall be UL-listed for use as flexible air ducts. Each flexible duct section shall be supported by a minimum of two (2) duct supports and shall not sag more 1/2 inch per linear foot of duct.
- C. In concealed and unconditioned spaces provide insulated flexible duct section with a double-ply polyester core or a heavy coated fiberglass cloth fabric core encapsulating a steel wire helix, and preventing all contact between the airstream and the insulating material. Minimum 12 inch W.C. working pressure from -20 degrees F to +250 degrees F, solid gray color. Flexmaster Type 3 or approved equal by other listed manufacturer.
- D. In exposed spaces provide uninsulated flexible duct section with a heavy coated fiberglass cloth fabric mechanically locked to encapsulate a steel wire helix. Minimum 12 inch W.C. working pressure from -20 degrees F to +250 degrees F, solid gray color. Flexmaster Type NI-45 or approved equal by other listed manufacturer.

E. Manufacturers: Flexmaster, Hart & Cooley, or Thermaflex.

2.08 FLEXIBLE CONNECTIONS

- A. Flexible duct connector shall be used where ductwork connects to fans of apparatus, or apparatus casing to fans to isolate vibration transfer. Connectors shall be attached in such a manner as to provide an airtight and waterproof seal. Connectors will comply with NFPA 90A, "Installation of Air Conditioning & Ventilation Systems" and NFPA 90B, "Installation of Warm Air Heating & Air Conditioning Systems."
- B. Indoor installations shall be of a UL 214 listed, fire retardant Vinyl coated woven nylon or Neoprene coated woven fiberglass fabric. Minimum density of Vinyl is 20 ounces per square yard and rated to 200 degrees F. Minimum density of Neoprene is 30 ounces per square yard and rated to 200 degrees F.
- C. Outdoor installations shall be of a UL 214 listed UV-resistant Hypalon coated wovenfiberglass fabric. Minimum density is 24 ounces per square yard and rated to 250 degrees F.

2.09 BLANK-OFF PANELS

- A. Provide 16 gauge, steel or aluminum, double skinned insulating blank-off panels behind louvers as indicated on the drawings. Material shall match louver material. Panel finish and color to match louver. Seal panel joints airtight. Provide panels with a minimum Rvalue of 6.

2.10 EXPOSED DUCTWORK

- A. All ductwork exposed in conditioned spaces shall be provided with a paint-grip galvanized finish or similar mill surface etch treatment for painting. Prime with Glidden #5229.
- B. On round ducts, provide pleated elbows.
- C. Take special care in applying duct sealants. Apply sealants at joints only in a neat and workman-like manner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All duct installations and duct construction shall comply with all requirements of this specification and meet or exceed SMACNA standards and recommendations for construction and installation.
- B. Provide turning vanes at all changes of direction supply and return ductwork.
- C. Seal all duct seams, joints, connections, and penetrations.
- D. Provide a minimum 6 inch flexible connection where ductwork connects to motor drive equipment. Do not bulge or install on a bind.
- E. Provide duct access doors at all fire dampers, smoke dampers, combination fire/smoke dampers, and motor-operated control dampers. Provide ceiling access panel in drywall or other inaccessible ceiling systems such that all such dampers are serviceable.

- F. Keep ductwork tight to underside of structure. Maintain at least 7 inches clear between duct and ceiling construction.
- G. Install all dampers and provide blank-off plate to seal frames airtight.
- H. Provide volume dampers as needed to balance system to airflow indicated on the drawings.
- I. Metallic flexible duct shall be attached with at least three (3) #8 sheet metal screws equally spaced around duct circumference, and five (5) #8 screws for ducts over 12 inches in diameter. Locate screws at least 1/2 inch from duct end.
- J. Non-Metallic flexible ducts shall be secured with a draw band. On ducts over 12 inches in diameter, position draw band behind a bead in the metal collar.
- K. Secure all insulation and vapor barriers on factory-fabricated flexible ducts with a separate draw band, independent of any used for the connection of the flexible duct to the duct collar.
- L. Provide duct access doors at all duct smoke detector locations. Coordinate locations with the Electrical Contractor.
- M. Galvanizing Repairs – Repair galvanizing damaged by welding, scratches, etc., using cold galvanizing compound.

3.02 TESTING

- A. Test Requirements:
 - 1. Installed ductwork shall be tested prior to installation of access doors, take-offs, etc.
 - 2. The Contractor shall give the Architect, Engineer, and Owner 72 hours notice prior to testing in order to provide an opportunity to witness the testing.
 - 3. Any testing conducted without prior notification providing an opportunity to witness the test shall be considered invalid and will be redone at the contractor's expense.
 - 4. Leak-test all ductwork. Air leakage in any tested section of ductwork shall not exceed that of SMACNA Leakage Class 6.
- B. Recommended Test Procedure: Perform testing in accordance with SMACNA HVAC Air Duct Leakage Test Manual and as follows below. Note that this reference establishes procedures only; and the allowable leakage rates are found in these Specifications.
 - 1. Use a certified orifice tube and its corresponding logarithmic chart for measuring the leakage. Supply fan must have a CFM capacity greater than the allowable leakage in CFM for the section being tested.
 - 2. Define section of system to be tested and blank off.
 - 3. Determine the percentage of the system being tested, on a square foot of surface area basis.
 - 4. Using the percentage determined in Step "3" and the maximum allowable leakage of 2% of the total system volume, determine the allowable leakage (cfm) for the section being tested.
 - 5. Pressurize to 100% of the duct pressure class design pressure and repair any significant or audible leaks.
 - 6. Pressurize again and measure leakage.
 - 7. Repeat Steps "5" and "6" until the leakage measured is less than the allowable defined in Step "4."
- D. Document all duct testing and submit testing results as part of "As-Built" documents. Furnish copies of all completed duct testing documentation upon request of the Architect, Engineer, or Owner.

3.03 DUCT CLEAN OUT

- A. Clean and blow out complete duct system before any connections to equipment are made. Inspect ductwork for debris before starting any fans.
- B. Interior surfaces shall be free of dust and debris prior to initial start up. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Any cleaning of duct systems shall comply with recommendations of NAIMA and NADCA.
- C. When internally cleaning duct work prior to installation or shipment to the jobsite, cover all duct ends and openings with a dual polyethylene protective film. Securely affix the film to protect against dirt and debris. Film must be translucent to facilitate inspection of interior surfaces without removing film. Film must have a minimum elongation of 600%, contain no VOC and leave no residue on duct after removal. Ductmate Industries "ProGuard" or approved equal.
- D. Clean external surfaces of foreign substances that might cause corrosion, deterioration of the metal, or where ductwork is to be painted.

3.04 CLEANLINESS REQUIREMENTS

A. Construction Indoor Air Quality:

- 1. Follow control measures of SMACNA IAQ Guidelines for Occupied Buildings Under Construction, Chapter 3, latest edition and as described below.
- 2. Protect stored on-site or installed absorptive materials from moisture damage.
- 3. Cap/seal supply, return, and exhaust air duct openings immediately after fabrication or cleaning. Schedule deliveries to the job site to match installation to avoid excessive storage at the job site. Store ductwork at the job site in closed trailers or in the immediate area in which it will be installed. Any ducts at the site that have any opening seals perforated are to be cleaned (if required). Maintain caps/seals on all openings of installed ducts. If openings of installed ducts have their seals perforated, clean contaminated duct sections. Demonstrate the cleanliness quality control to the Construction Manager. The duct cleanliness shall meet the advanced level of the SMACNA New Construction Guidelines.

END OF SECTION

SECTION 23 33 00**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 09 33: Temperature control damper actuators and actuator linkages.
 - 2. Section 23 30 01: Common Duct Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C 1071-00, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Acoustical Material).'
 - b. ASTM C 1338-00, 'Standard Test Method for Determining the Fungi Resistance of insulation Materials and Facings.'

PART 2 - PRODUCTS**2.1 ACCESSORY PRODUCTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. AGM Industries, Brockton, MA www.agmind.com.
 - b. Air Balance Inc, Holland, OH www.airbalance.com.
 - c. Air Filters Inc, Baltimore, MD www.afinc.com.
 - d. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - e. American Warming & Ventilating, Holland, OH www.american-warming.com.
 - f. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - g. Cain Manufacturing Company Inc, Pelham, AL www.cainmfg.com.
 - h. C & S Air Products, Fort Worth, TX www.csairproducts.com.
 - i. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - j. Cesco Products, Florence, KY www.cescoproducts.com.
 - k. Daniel Manufacturing, Ogden, UT (801) 622-5924.
 - l. Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - m. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - n. Dyn Air Inc. Lachine, QB www.dynair.ca
 - o. Elgen Manufacturing Company, Inc. East Rutherford, NJ www.elgenmfg.com
 - p. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com.
 - q. Greenheck Corp, Schofield, WI www.greenheck.com.
 - r. Gripnail Corp, East Providence, RI www.gripnail.com.
 - s. Hardcast Inc, Wylie, TX www.hardcast.com.
 - t. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - u. Industrial Acoustics Co, Bronx, NY www.industrialacoustics.com.
 - v. Johns-Manville, Denver, CO www.jm.com.
 - w. Kees Inc, Elkhart Lake, WI www.kees.com.
 - x. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.

- y. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
- z. Metco Inc, Salt Lake City, UT (801) 467-1572.
- aa. Miracle / Kingco, Rockland, MA www.taccint.com.
- bb. Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
- cc. Nailor Industries Inc, Houston, TX www.nailor.com.
- dd. Owens Corning, Toledo, OH www.owenscorning.com.
- ee. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
- ff. Pottorff Company, Fort Worth, TX www.pottorff.com.
- gg. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
- hh. Sheet Metal Connectors Inc, Minneapolis, MN www.smconnectors.com.
- ii. Techno Adhesive, Cincinnati, OH www.technoadhesives.com.
- jj. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
- kk. McGill AirFlow, Groveport, OH www.mcgillairflow.com.
- ll. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- mm. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- nn. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
- oo. Young Regulator Co, Cleveland, OH www.youngregulator.com.

B. Materials:

- a. Adhesive:
 - 1) Category Four Approved Water-Based Products. See Section 01 6200 for definitions of Categories.
 - a) Cain: Hydrotak.
 - b) Design Polymerics: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Hardcast: Coil-Tack.
 - e) Miracle / Kingco: PF-101.
 - f) Mon-Eco: 22-67 or 22-76.
 - g) Polymer Adhesive: Glasstack #35.
 - h) Techno Adhesive: 133.
 - i) McGill Airseal: Uni-tack.
 - 2) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories.
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.
 - c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
 - 3) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories.
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.
 - c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.
 - g) Techno Adhesive: 'Flammable' 106.
- b. Fasteners:
 - 1) Adhesively secured fasteners not allowed.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) AGM Industries Inc: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnails may be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.
- 2. Flexible Equipment Connections:
 - a. 30 oz closely woven UL approved glass fabric, double coated with neoprene.

- b. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of **250 deg F 121 deg C**.
- c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cain: N-100.
 - 2) Duro Dyne: MFN.
 - 3) Elgen: ZLN.
 - 4) Ventfabrics: Ventglas.
 - 5) Ductmate: ProFlex.
- 3. Dampers And Damper Accessories:
 - a. Locking Quadrant Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Duro Dyne: KS-38.
 - b) Ventfabrics: Ventline 555.
 - c) Young: No. 1.
 - b. Concealed Ceiling Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Cain.
 - b) Duro Dyne.
 - c) Metco Inc.
 - d) Ventfabrics: 666 Ventlok.
 - e) Young: 301.
 - c. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured **16 ga 1.59 mm** galvanized steel, single blade and opposed blade type with **3/8 inch 10 mm** axles and end bearings. Blade width **8 inches 200 mm** maximum. Blades shall have **1/8 inch 3 mm** clearance all around.
 - b) Damper shall operate within acoustical duct liner.
 - c) Provide channel spacer equal to thickness of duct liner.
 - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Air-Rite: Model CD-2.
 - (2) American Warming: VC-2-AA.
 - (3) Arrow: OBDAF-207.
 - (4) C & S: AC40.
 - (5) Cesco: AGO.
 - (6) Daniel: CD-OB.
 - (7) Greenheck: VCD-20.
 - (8) Pottorff: CD-42.
 - (9) Ruskin: MD-35.
 - (10) Uttemp: CD-OB.
 - 2) Round Duct:
 - a) Factory-manufactured **20 ga 1.06 mm** galvanized steel, single blade with **3/8 inch 10 mm** axles and end bearings.
 - b) For use in outside air ducts.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Air Balance: Model AC-22.
 - (2) American Warming: V-22.
 - (3) Arrow: Type-70.
 - (4) C & S: AC21R.
 - (5) Cesco: MGG.
 - (6) Pottorff: CD-21R.
 - (7) Ruskin: MDRS-25.
 - d) Make provision for damper actuators and actuator linkages to be mounted external of air flow.
 - 3) Rectangular Ducts:
 - a) Damper Blades:

- (1) Steel or aluminum airfoil type with mechanically locked blade seals, **8 inch 200 mm** blade width maximum measured perpendicular to axis of damper.
- (2) Jamb seals shall be flexible metal compression type.
- (3) Opposed or single blade type.
- b) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Air Balance: AC 526.
 - (2) American Warming: AC526.
 - (3) Arrow: AFD-20.
 - (4) C & S: AC50.
 - (5) Cesco: AGO3.
 - (6) Honeywell: D-643.
 - (7) Pottorff: CD-52.
 - (8) Ruskin: CD-60.
- 4) Round Ducts:
 - a) Damper Blades:
 - (1) Steel with mechanically locked blade seals.
 - (2) Blade seals shall be neoprene or polyethylene.
 - (3) Single blade type.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - (1) Air Balance: AC 25.
 - (2) American Warming: VC25.
 - (3) Arrow: Type 70 or 75.
 - (4) C & S: AC25R.
 - (5) Cesco: AGG.
 - (6) Honeywell: D-690.
 - (7) Pottorff: CD-25R.
 - (8) Ruskin: CD25
 - d) Backdraft Dampers:
 - 1) Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
 - 2) Stop shall be galvanized steel screen or expanded metal, **1/2 inch 13 mm** mesh.
 - 3) Frame shall be galvanized steel or extruded aluminum alloy.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Air-Rite: Model BDD-3.
 - b) American Warming: BD-15.
 - c) C & S: BD30.
 - d) Cesco: FBD 101.
 - e) Daniel: FBD-H/V.
 - f) Pottorff: 50FBD.
 - g) Ruskin: NMS2.
 - h) UTEMP: BFEA.
- 4. Duct Silencers:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Air Filters Inc.: AIRSAN.
 - 2) Industrial Acoustic Co.
 - 3) Titus Products Div.
 - 4) McGill AirsealCorp.
- 5. Air Turns:
 - a. Single thickness vanes. Double thickness vanes not acceptable.
 - b. **4-1/2 inch 113 mm** wide vane rail. Junior vane rail not acceptable.
- 6. Branch Tap for Flexible Ductwork:
 - a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of **24 ga 0.635 mm** zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
 - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - c. Manual Volume Damper:
 - 1) Single blade, **22 ga 0.79 mm** minimum
 - 2) **3/8 inch 10 mm** minimum square rod with brass damper bearings at each end.

- 3) Heavy-duty locking quadrant on **1-1/2 inch 38 mm** high stand-off mounting bracket attached to side of round duct.
- d. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) ST-1HD by Air-Rite.
 - 2) STO by Flexmaster.
 - 3) HET by Sheet Metal Connectors.

C. Fabrication:

1. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.
- B. Dampers And Damper Accessories:
 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.
 - c. Dampers in branch ducts shall fit against fiber glass duct walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against fiber glass duct.
 - d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION

SECTION 23 33 46**FLEXIBLE DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 30 01: Common Duct Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anco Products Inc, Elkhart, IN www.ancoproductsinc.com.
 - b. Thermaflex by Flexible Technologies, Abbeville, SC or Mississauga, ON www.thermaflex.net.
 - c. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com or Flexmaster Canada Ltd, Richmond Hill, ON (905) 731-9411.
- B. Materials:
 - 1. Ducts:
 - a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
 - b. Insulation: Nominal **1-1/2 inches 38 mm**, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
 - c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A-1989 and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) ANCO-FLEX 4625 by Anco Products.
 - 2) M-KC by Thermaflex by Flexible Technologies.
 - 3) Type 4m Insulated by Flexmaster.
 - 2. Cinch Bands: Nylon, **3/8 inch 10 mm** removable and reusable type.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install duct in fully extended condition free of sags and kinks, using **72 inch 1 800 mm** maximum lengths.
- B. Make duct connections by coating exterior of duct collar for **3 inches 75 mm** with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

SECTION 23 34 00**HVAC FANS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exhaust fans as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.
 - 2. Division 26: Control device and electrical connection.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Bear AMCA seal and UL label.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Acme Engineering & Manufacturing Corp, Muskogee, OK www.acmefan.com.
 - 2. Breidert Air Products, Jacksonville, FL www.breidert.com.
 - 3. Carnes Co, Verona, MI www.carnes.com.
 - 4. Greenheck Corp, Schofield, WI www.greenheck.com.
 - 5. Loren Cook Co, Springfield, MO www.lorencook.com.
 - 6. PennBarry, Richardson, TX (215) 464-8900 www.pennbarry.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Mounted Exhaust Fans:
 - 1. Acoustically insulated housings. Sound level rating of 4.6 sones maximum for fan RPM and CFM listed on Drawings.
 - 2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
 - 3. True centrifugal wheels.
 - 4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
 - 5. Suitably ground motors and mount on rubber-in shear vibration isolators.
 - 6. Provide wall or roof cap, as required.
 - 7. Class One Quality Standards:
 - a. Greenheck SP.
 - b. PennBarry Zephyr.
 - 8. Approved Manufacturers. See Section 01 6200.
 - a. Acme, Breidert, Broan, Carnes, Cook-Gemini, Greenheck, PennBarry.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor fan units securely to structure or to curb.

END OF SECTION

SECTION 23 37 13**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: General Duct Requirements.

1.2 SUBMITTALS

- A. Maintenance Material Submittals:
 - 1. Tools: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Carnes Co, Verona, MI www.carnes.com
 - 2. J & J Register, Grand Rapids, MI www.jandjreg.com.
 - 3. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 - 4. Metal*Aire by Metal Industries Inc, Clearwater, FL www.metalaire.com.
 - 5. Nailor Industries Inc, Houston, TX www.nailor.com.
 - 6. Price Industries Inc, Suwanee, GA www.price-hvac.com.
 - 7. Titus, Richardson, TX www.titus-hvac.com.
 - 8. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Supply Grilles And Registers:
 - 1. Finish: Off-white baked enamel.
 - 2. Removable core.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: RVEA.
 - b. J & J: 2815.
 - c. Krueger: 5815.
 - d. Metal*Aire: 42C.
 - e. Nailor: 51RCD.
 - f. Price: LBMR/DV1.
 - g. Titus: 1707.
 - h. Tuttle & Bailey: VF5.
- B. Ceiling Return And Transfer Grilles:
 - 1. Finish: Off-white baked enamel.
 - 2. **1/2 inch 13 mm** spacing.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.

- a. Carnes: RSLA.
- b. J & J: S90H.
- c. Krueger: S85H.
- d. Metal*Aire: SRH.
- e. Nailor: 6155H.
- f. Price: 535.
- g. Titus: 355RL or 355 RS.
- h. Tuttle & Bailey: T70D.

C. High Side Wall Return Grilles:

- 1. Finish: Off-white baked enamel.
- 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: RHEA.
 - b. J & J: 2810.
 - c. Metal*Aire: 41C.
 - d. Krueger: 5810.
 - e. Nailor: 51RC.
 - f. Price: LBMR.
 - g. Titus: 1700.
 - h. Tuttle & Bailey: VF.

D. Floor / Toe Space Return Grilles:

- 1. Finish: Clear anodized.
- 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: CCJB (with mitered corners welded on face and sanded).
 - b. J & J: 2500 with Frame 10.
 - c. Krueger: 1500F.
 - d. Metal*Aire: 2000F.
 - e. Nailor: 49-240-FN-MM.
 - f. Price: LBP-25B.
 - g. Titus: CT-540.
 - h. Tuttle & Bailey: LFD.

E. Low Sidewall Return Grilles:

- 1. Finish: Off-white baked enamel.
- 2. 38 or 45 degree deflection.
- 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: RSAH.
 - b. J & J: S-590.
 - c. Krueger: S480H.
 - d. Metal*Aire: HD-RH.
 - e. Nailor: 6145H-HD.
 - f. Price: 90-L.
 - g. Titus: 33RL or 33RS.
 - h. Tuttle & Bailey: T110.

F. Soffit Grilles:

- 1. Finish: Baked enamel. Match soffit color.
- 2. Aluminum with aluminum mesh insect screen.
- 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: RAAA.
 - b. J & J: ALS95H.
 - c. Krueger: S585H.
 - d. Metal*Aire: RHE.
 - e. Nailor: 5155-IS.
 - f. Price: 635.
 - g. Titus: 355FL.
 - h. Tuttle & Bailey: A70D-5.

G. Ceiling Diffusers:

1. Finish: Off-white baked enamel.
2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes: SKSA.
 - b. J & J: R-1400.
 - c. Krueger: SH.
 - d. Metal*Aire: 5500S.
 - e. Nailor: 65OOB.
 - f. Price: SMD-6.
 - g. Titus: TDC-6.
 - h. Tuttle & Bailey: MS

H. Ceiling Slot Diffusers:

1. Linear slot type with 180 deg adjustable air pattern and aluminum construction.
2. Provide type 2B frame and end border at each end.
3. Finish: Off-white baked enamel.
4. Class One Quality Standard: Titus ML-39.
5. Approved Manufacturers. See Section 01 6200.
 - a. Krueger, Metal*Aire, Titus.

I. Door Grilles:

1. Finish: Baked enamel. Match door as closely as possible as approved by Architect.
2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Carnes.
 - b. J & J.
 - c. Krueger.
 - d. Metal*Aire.
 - e. Nailor: 610GD.
 - f. Price: STGI-BF.
 - g. Titus: T-700.
 - h. Tuttle & Bailey.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

3.2 ADJUSTING

- A. Set sidewall supply register blades at 15 degrees upward deflection.

END OF SECTION

SECTION 23 37 14**LOUVERS AND VENTS****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install louvers connected to ductwork as described in Contract Documents.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

A. Manufacturer List:

1. Airolite Co, Marietta, OH www.airolite.com.
2. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
3. American Warming & Ventilating, Holland, OH www.awv.com.
4. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
5. Carnes Co, Verona, WI www.carnes.com.
6. Industrial Louvers Inc, Delano, MN www.industriallouvers.com.
7. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
8. Vent Products Co Inc, Chicago, IL www.ventprod.com.
9. Wonder Metals Corp, Redding, CA www.wondermetals.com.

2.2 MANUFACTURED UNITS

A. Louvers:

1. General:
 - a. Extruded aluminum, with blades welded or screwed into frames.
 - b. Frames shall have mitered corners.
 - c. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.
 - d. Finish:
 - 1) Polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
 - 2) Color as selected by Architect from Manufacturer's standard colors.
2. Louvers Connected To Ductwork:
 - a. **1/2 inch 13 mm mesh 16 ga 1.59 mm** aluminum bird screen.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) K638 by Airolite.
 - 2) LE-1 by Air-Rite Manufacturing.
 - 3) LE48 by American Warming & Ventilating.
 - 4) EA-405 by Arrow United Industries.
 - 5) FKDA by Carnes.
 - 6) 455-XP by Industrial Louvers.
 - 7) ELF81S30 by Ruskin.
 - 8) 2740-31 by Vent Products.
 - 9) EX by Wonder Metals.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings.
- B. Where louvers touch masonry or dissimilar metals, protect with heavy coat of asphaltum paint.

END OF SECTION

SECTION 23 37 23**HVAC GRAVITY VENTILATORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install roof vents as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer List:
 - 1. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - 2. Breidert Air Products, Jacksonville, FL www.breidert.com.
 - 3. Carnes Company, Verona, WI www.carnes.com.
 - 4. Greenheck Fan Corporation, Schofield, WI www.greenheck.com.
 - 5. Loren Cook Co, Springfield, MO www.lorencook.com.
 - 6. Vent Products Co, Inc, Chicago, IL www.ventprod.com.

2.2 MANUFACTURED UNITS

- A. Roof Vents:
 - 1. Penthouse type of extruded aluminum complete with roof curb to fit slope of roof and **1/2 inch 13mm** mesh **16 ga 1.5 mm** aluminum bird screen.
 - 2. Finish as specified by Architect.
 - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Tiered Type: Model TRE extruded aluminum ventilator by Loren Cook.
 - b. Louvered Penthouse:
 - 1) Model RLX by Breidert Air Products.
 - 2) Model GLAB by Carnes.
 - 3) Model WRH by Greenheck.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 23 41 00**AIR FILTERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install filters used in mechanical equipment.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Furnace Filters: One inch 25 mm thick throw-away type as recommended by Furnace Manufacturer.
- B. Fan Coil Unit Filters: One inch 25 mm thick throw-away type as recommended by Fan Coil Unit Manufacturer.
- C. Air Handling Unit Filters:
 - 1. 2 inch 50 mm thick, medium efficiency, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft of face area.
 - 2. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to 'Vyclad B' and continuously laminated to supporting steel wire grid conforming to configuration of pleats.
 - 3. Media pack shall be sealed in a chipboard frame or beverage board.
 - 4. Filters shall have rated average efficiency of 25 to 30 percent on ASHRAE Test Standard 52-76 and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.
 - 5. Initial resistance shall not exceed 0.30 inches wg at 500 FPM or 0.14 inch wg at 300 FPM. Filter shall be listed Class 2 by UL.
 - 6. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. DP-40 by Airguard Industries Inc, Louisville, KY www.airguard.com.
 - b. Aerostar Series 400 by Filtration Group, Santa Rosa, CA www.filtraiongroup.com.
 - c. PrePleat 40 by Flanders, St Petersburg, FL www.flanderscorp.com.
 - d. Type 30/30 by Camfil Farr Co, Riverdale, NJ www.camfilfarr.com.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Provide ample access for filter removal.

3.2 FIELD QUALITY CONTROL

- A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

END OF SECTION

SECTION 23 62 13**AIR-COOLED REFRIGERANT CONDENSERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
 - 1. Condensing units.
- B. Related Sections:
 - 1. Section 01 6400: Owner will furnish Condensing units. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
 - 2. Section 23 0501: Common HVAC Requirements.
 - 3. Section 23 2300: Refrigerant Piping System.

1.2 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Reports: Equipment check-out sheets.
 - 2. Qualification Statements: Technician certificate for use of CFC, HFC, and HCFC refrigerants.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Each unit shall be UL / ULC labeled.
- B. Qualifications:
 - 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

1.4 WARRANTY

- A. Ten-year parts and labor warranty on condensing units from date of 'start-up.' Record 'start-up' date on warranty certificate for each unit.

PART 2 - PRODUCTS**2.1 OWNER-FURNISHED PRODUCTS**

- A. Manufacturer:
 - 1. Carrier
 - 2. Trane
 - 3. York
 - 4. Daikin
- B. Performance:
 - 1. Capacities: SEER rating as defined by ARI shall be 14.0 or greater
- C. Manufactured Units:
 - 1. Condensing Units:
 - a. General:

- 1) Units shall be operable down to **0 deg F minus 18 deg C** outdoor temperature when outside winter design temperature is below **35 deg F 2 deg C**.
- 2) Use R-410a refrigerant.
- 3) Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.
- b. Condenser Coils:
 - 1) Aluminum plate fins mechanically bonded to seamless copper tubes.
 - 2) Provide coil guard for unit.
- c. Fans:
 - 1) Direct driven propeller upflow type.
 - 2) Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
 - 3) Motors shall be resiliently mounted.
 - 4) Each fan shall have a safety guard.
- d. Compressor:
 - 1) Each condenser unit shall have only one compressor.
 - 2) Scroll design with following features:
 - a) Externally mounted brass service valves with charging connections.
 - b) Crankcase heater.
 - c) Resilient rubber mounts.
 - d) Compressor motor-overload protection.
 - e) Single speed.
- e. Controls:
 - 1) Factory wired and located in separate enclosure.
 - 2) Factory installed safety devices:
 - a) High and low pressure cutout.
 - b) Condenser fan motor-overload devices.
 - 3) Factory-installed anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.
 - 4) Low ambient kit.
- f. Casing:
 - 1) Fully weatherproof for outdoor installation. Finish shall be weather resistant.
- g. Openings shall be provided for power and refrigerant connections.
- h. Panels shall be removable for servicing.
- i. Approved Products:
 - 1) York CZB.

2.2 ACCESSORY PRODUCTS

- A. Vibration Isolators: **4 inches 100 mm** square by **3/4 inch 19 mm** thick minimum neoprene type vibration isolation pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set condensing units level on concrete slab on vibration isolation pads located at each corner of unit.
- B. Do not use capillary tube and piston type refrigerant metering devices.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service:
 1. Condensing units shall be started up, checked out, and adjusted by Condensing Unit Manufacturer's authorized factory trained service mechanic.

2. Use equipment checkout sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

SECTION 23 82 16**AIR COILS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Outside air pre-heat coils.
- B. Related Requirements:
 - 1. Section 23 0501: Common HVAC Requirements.
 - 2. Section 23 3114: Low-Pressure Metal Ducts and installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Category Four Approved Manufacturers And Suppliers. See Section 01 6200 for definitions of Categories.
 - 1. Carrier:
 - 2. York:
 - 3. Trane:
 - 4. Daikin:

2.2 MANUFACTURED UNITS

- A. Air Coils:
 - 1. Single or double row type suitable for hot water with same end connections.
 - 2. 1/2 inch diameter copper tubes with 0,024 inch minimum wall thickness
 - 3. **16 ga 1.59 mm** galvanized steel casing and secondary drain pan installed underneath coil. Drain pan shall be properly reinforced to prevent collapse due to water held in pan. **2 inches 50 mm** deep minimum with **3/4 inch 19 mm** drain.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 26 05 01
COMMON ELECTRICAL REQUIREMENTS

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General electrical system requirements and procedures.
 - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 - 3. Make electrical connections to equipment provided under other Sections.
 - 4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
 - 1. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 2. Section 31 2316: Criteria for performance of excavating.
 - 3. Section 31 2323: Criteria for performance of backfilling.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Provide following information for each item of equipment:
 - 1) Catalog Sheets.
 - 2) Assembly details or dimension drawings.
 - 3) Installation instructions.
 - 4) Manufacturer's name and catalog number.
 - 5) Name of local supplier.
 - b. Furnish such information for following equipment:
 - 1) Sections 26 2417 / 8: Panelboards.
 - 2) Section 26 2726: Wiring devices.
 - 3) Section 26 2774: Bell system.
 - 4) Section 26 2816: Enclosed switches and circuit breakers.
 - 5) Section 26 5100: Interior lighting fixtures.
 - 6) Section 26 5200: Emergency battery units.
 - c. Do not purchase equipment before approval of product data.
 - 2. Shop Drawings:
 - a. Submit on Panelboards.
 - b. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports: Report of site tests, before Substantial Completion.
- C. Closeout Submittals:
 - 1. Operations And Maintenance Manual Data:
 - a. Modify and add to requirements of Section 01 7000 as follows:

- 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 2. Material and equipment provided shall meet standards of NEMA or UL and bear their label wherever standards have been established and label service is available.

1.4 OWNER'S INSTRUCTIONS

- A. Provide competent instructor for three days to train maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

1.5 SCHEDULING

- A. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.
- B. Coordinate with Owner for equipment and materials to be removed by Owner.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Performance:
 1. Design Criteria:
 - a. Materials and equipment provided under following Sections shall be by same Manufacturer:
 - 1) Section 26 2417: Panelboards.
 - 2) Section 26 2816: Enclosed Switches And Circuit Breakers.
 - 3) Section 26 2913: Enclosed Controllers.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Approved Electrical Installers. See Section 01 4300 for definitions of Categories.

3.2 EXAMINATION

- A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.
- B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.3 PREPARATION

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.
- C. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- D. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- E. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically specified to be performed under other Sections of the specifications.

3.4 INSTALLATION

- A. General:
 1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

3.6 CLEANING

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

END OF SECTION

SECTION 26 05 03**ELECTRICAL UTILITY SERVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install service as described in Contract Documents and as required by local serving agency.
 - 2. Complete cost of service.
- B. Related Requirements:
 - 1. Section 03 3053: Transformer pad.
 - 2. Section 26 0501: Common Electrical Requirements.
 - 3. Local utility shall furnish and install primary underground service including transformer, conductors, current transformers, metering conductors, and meter.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Interface with Other Work: Coordinate with serving agency on all items, especially service entrance fittings, meter sockets, and current transformer (C/T) boxes where required.

END OF SECTION

SECTION 26 05 19**LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
 - 1. Section 23 0933: Conductors and cables for temperature control system.
 - 2. Section 26 0501: Common Electrical Requirements.

1.2 REFERENCES

- A. Definitions:
 - 1. Line Voltage: Over 70 Volts.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Line Voltage Conductors:
 - 1. Copper with AWG sizes as shown:
 - a. Minimum size shall be No. 12 except where specified otherwise.
 - b. Conductor size No. 8 and larger and wiring inside walk-in Cooler and Freezer shall be stranded.
 - 2. Insulation:
 - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg C).
 - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg C).
 - c. Higher temperature insulation as required by NEC or local codes.
 - 3. Colors:
 - a. 208Y / 120 V System:
 - 1) Black: Phase A.
 - 2) Red: Phase B.
 - 3) Blue: Phase C.
 - 4) Green: Ground.
 - 5) White: Neutral.
 - b. 480Y / 277 Volt System:
 - 1) Brown: Phase A.
 - 2) Orange: Phase B.
 - 3) Yellow: Phase C.
 - 4) Gray: Neutral.
 - 5) Green: Ground.
 - c. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
 - d. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
 - B. Standard Connectors:
 - 1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 - 2. Conductors Larger Than No. 8: Pressure type terminal lugs.

3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.
- C. Terminal blocks for tapping conductors:
 1. Terminals shall be suitable for use with 75 deg C copper conductors.
 2. Acceptable Products:
 - a. 16323 by Cooper Bussmann, Ellisville, MO www.bussmann.com
 - b. LBA363106 by Square D Co, Palatine, IL www.us.squared.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Conductors and cables shall be continuous from outlet to outlet.
 2. Do not use direct burial cable.
- B. Line Voltage Conductors (Over 70 Volts):
 1. Install conductors in raceway except where specifically indicated otherwise. Run conductors of different voltage systems in separate conduits.
 2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Drawings.
 3. Neutrals:
 - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
 - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
 - c. Run separate neutrals for each circuit where specifically noted on Drawings.
 - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs so neutral conductors will carry only unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
 4. Pulling Conductors:
 - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling conductors.
 - c. Use only listed wire pulling lubricants.

END OF SECTION

SECTION 26 05 23**CONTROL-VOLTAGE ELECTRICAL CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install control-voltage electrical cables as described in Contract Documents.
 - 2. Furnish and install building telephone / data system cables as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 01 1000: Owner will terminate building telephone cables at terminal board.
 - 2. Section 23 0933: Cables for Temperature Control System.
 - 3. Section 26 0501: Common Electrical Requirements.
 - 4. Section 28 3101: Cables for Fire Detection System.

1.2 REFERENCES

- A. Definitions:
 - 1. Control Voltage: 70 Volts and under.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Alpha Wire Co, Elizabeth, NJ www.alphawire.com.
 - b. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - c. Liberty Wire & Cable, Colorado Springs, CO www.libertycable.com.
 - d. West Penn Wire Corp, Washington, PA www.westpenn-cdt.com.
- B. Components:
 - 1. Building Telephone / Data System Cables.
 - a. CAT 5E, 24 AWG, solid bare copper, four pair, UTP.
 - b. Sheath Colors:
 - 1) Telephone: White.
 - 2) Data: Blue.
 - c. Meet requirements of EIA / TIA 568 Standard.
 - 2. Building Telephone System Cables:
 - a. CAT 5E, 24 AWG, solid copper, four pair, UTP, white cable jacket.
 - b. Meet requirements of TIA / EIA 568 Standard.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General:
 - 1. Cables shall be continuous and without splices from terminal board to outlet.
 - 2. Install cables in raceway. Run cables of different systems in separate conduits.

3. Pulling Conductors:
 - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling conductors.
 - c. Use only listed wire pulling lubricants.
- B. Telephone / Data System Cables:
 1. Install cable from terminal board to each telephone and data outlet unless indicated otherwise on Drawings.
 2. Leave adequate slack cable at terminal board and outlets for termination of each cable run.
- C. Sound And Video Systems Cables:
 1. Label cables at each end with cable markers for use of sound system and video system installers.
 2. Run separate insulated No. 6 grounding conductor from each equipment cabinet to electrical panel. Do not use intermediate connections or splices.
 3. Extend cables **18 inches 450 mm** from wall or ceiling at all outlets and speaker locations. Extend cables and grounding conductors to twice vertical length of cabinet at each cabinet location.
 4. For cables not installed in metallic raceway, do not run cables within 10 inches of line voltage conductors / raceways. Also, maintain 10 inches minimum between following exposed cable groups:
 - a. Microphone cables.
 - b. CAT-5, CAT-6, sound system control, telephone, video, or ATC cables.
 - c. Loudspeaker cables.

END OF SECTION

SECTION 26 05 26**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Type One Acceptable Products:
 - a. 'Cadweld' by Erico International, Solon, OH www.erico.com.
 - b. 'ThermOweld' by Continental Industries, Tulsa, NE www.conind.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
 - 1. Design Criteria: Size materials as shown on Drawings and in accordance with applicable codes.
- C. Materials:
 - 1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
 - 2. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps listed for such use.
 - 3. Service Grounding Connections And Cable Splices: Make by exothermic process.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.
- B. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
 - 1. Electrical service, its equipment and enclosures.
 - 2. Conduits and other conductor enclosures.
 - 3. Neutral or identified conductor of interior wiring system.
 - 4. Main panelboard, power and lighting panelboards.

5. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- C. Grounding connection to main water supply shall be accessible for inspection and made within **6 inches 150 mm** of point of entrance of water line to building. Provide bonding jumpers across water meter and valves to assure electrical continuity.
- D. Provide concrete-encased electrode system by embedding **20 feet 6 000 mm** minimum of No. 2/0 bare copper conductor in concrete footing, **2 inches 50 mm** minimum below concrete surface. Extend No. 2/0 copper conductor to main panel as shown on Drawings.
- E. Ground identified common conductor of electrical system at secondary side of main transformer supplying building. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.
- F. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding **72 inches 1800 mm** in length, and in flexible conduit connecting to mechanical equipment.
- G. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- H. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- I. Connect equipment grounds to building system ground.
 1. Use same size equipment grounding conductors as phase conductors up through #10 AWG.
 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.
- J. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- K. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- L. Ground cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections: Notify Architect for inspection two days minimum before placing concrete over grounding conductor.

END OF SECTION

SECTION 26 05 33**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 - 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
 - 3. Installation of Owner supplied corner A/V equipment cabinets.
 - 4. Furnish and install main telephone service raceway as described in Contract Documents and to comply with telephone company requirements.
 - 5. Furnish and install main electrical service raceway to comply with electrical utility company requirements.
- B. Related Requirements:
 - 1. Section 26 0501: General Electrical Requirements.
 - 2. Section 26 0503: Local electrical utility company shall furnish and install primary underground service.
 - 3. Section 27 4117: Furnishing and installing of satellite dish and TV distribution systems by Church approved installer and not to be included as part of work of this Section.
 - 4. Section 27 5117: Furnishing and installing of sound system by Church approved installer and not to be included as part of work of this Section.
 - 5. Section 28 3100: Furnishing and installing of raceway and conduit for fire detection and alarm system.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cooper B-Line, Highland, IL www.b-line.com.
 - b. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com.
 - c. Square D, Palatine, IL www.squared.com.
 - d. Steel City, Div Thomas & Betts, Memphis, TN www.tnb.com.
 - e. Thomas & Betts, Memphis, TN www.tnb.com.
 - f. Walker Systems Inc, Williamstown, WV (800) 240-2601.
 - g. Wiremold Co, West Hartford, CT www.wiremold.com.
- B. Performance:
 - 1. Design Criteria: All aspects of design of sound system have been included as requirements of Owner. Do not make changes to any aspects of installation, design, or equipment pertaining to sound system without Owner's approval through Architect and Sound Consultant.
- C. Materials:
 - 1. Raceway And Conduit:
 - a. Sizes:
 - 1) **3/4 inch 19 mm** for exterior use, unless indicated otherwise.
 - 2) **1/2 inch 13 mm** for interior use, unless indicated otherwise.
 - b. Types: Usage of each type is restricted as specified below by product.

- 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
- 2) Galvanized Electrical Metallic Tubing (EMT), Flexible Steel Conduit, And Metal-Clad Cable (Type MC):
 - a) Allowed for use only in indoor dry locations where it is:
 - (1) Not subject to damage.
 - (2) Not in contact with earth.
 - (3) Not in concrete.
 - b) Flexible steel conduit or metal-clad cable required for final connections to indoor mechanical equipment.
- 3) Schedule 40 Polyvinyl Chloride (PVC) Conduit:
 - a) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
- 4) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches** **900 mm**.
- 5) Electrical Non-Metallic Tubing (ENT): Allowed for use only as a raceway for control voltage cables in concealed or inaccessible, indoor, dry locations.
- c. Prohibited Raceway Materials:
 - 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.

2. Raceway And Conduit Fittings:
 - a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
 - b. EMT:
 - 1) Compression type.
 - 2) Steel set screw housing type.
 - c. PVC Conduit:
 - 1) PVC type. Use PVC adapters at all boxes.
 - 2) PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
 - d. Flexible Steel Conduit: Screw-in type.
 - e. Liquid-tight Flexible Metal Conduit: Sealite type.
 - f. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
 - g. Prohibited Fitting Materials:
 - 1) Crimp-on, tap-on, indenter type fittings.
 - 2) Cast set-screw fittings for EMT.
 - 3) Spray (aerosol) PVC cement.
3. Cord-Ended Metal Surface Raceway:
 - a. Grey finish.
 - b. **40 inches** **1000 mm** long with **72 inch** **1800 mm** long cord and grounding type plug.
 - c. Six receptacles spaced **6 inches** **150 mm** on center.
 - d. Type One Acceptable Products:
 - 1) Wiremold G20-C4
 - 2) Equal as approved by Architect before bidding. See Section 01 6200.
4. Multi-Outlet Assemblies:
 - a. **18 inches** **450 mm** between outlets.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) 2GW Series by Walker.
 - 2) Plugmold 20GB Series by Wiremold.
5. Seal Devices: OZ Type WSK.
6. Outlet Boxes:
 - a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
 - 1) Provide metal supports and other accessories for installation of each box.
 - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
 - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
 - b. Plastic boxes may be used only in low voltage systems where conductors are not installed in conduit.

- c. Telephone / data outlet boxes shall be single device outlet boxes.
- d. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be **4 inches 100 mm** square.
 - 2) Boxes for remote temperature sensor devices shall be recessed single device.
 - 3) Boxes for thermostats shall be **4 inches 100 mm** square with raised single device cover.
- 7. Air / Vapor Barrier Back Boxes: Pre-molded polyethylene fitting between framing members and inhibiting air / vapor infiltration and exfiltration around recessed outlet boxes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
 - 2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
 - a. Coordinate location of outlet for water cooler with Division 22.
 - b. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlet under his direction.
 - 3. Coordinate installation of floor boxes in carpeted areas with carpet installer to obtain carpet for box doors.
 - 4. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. General:
 - 1. Sound and video system electrical components furnished and installed under this Section include following items:
 - a. Metal equipment cabinet and control cabinets.
 - b. Factory-fabricated speaker enclosures.
 - c. Fittings.
- C. Conduit And Raceway:
 - 1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
 - 2. Keep raceway runs **6 inches 150 mm** minimum from hot water pipes.
 - 3. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
 - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
 - b. Radius of curve shall be at least minimum indicated by NEC.
 - 4. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
 - 5. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
 - 6. Bend PVC conduit by hot box bender and, for PVC **2 inches 50 mm** in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
 - 7. Installation in Concrete:

- a. Install no conduit in concrete unless outside diameter is less than 1/3 of slab, wall, or beam thickness in which it is embedded.
- b. Position conduits in center of concrete below reinforcing steel, and separated by minimum lateral spacing of three diameters.
- c. Elbows embedded in concrete shall be rigid steel or IMC and stubouts from concrete slabs shall extend **3 inches 75 mm** minimum before making connection to EMT.
- d. Separate conduits penetrating structural slabs in buildings by **2 inches 50 mm** minimum.
- e. Install seal device where underground raceways penetrate concrete building wall.
- 8. Installation In Framing:
 - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches 600 mm** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be **one inch 25 mm** diameter maximum.
- 9. Underground Raceway And Conduit:
 - a. Bury underground raceway installed outside building **24 inches 600 mm** deep minimum.
 - b. Bury underground conduit in planting areas **18 inches 450 mm** deep minimum. It is permissible to install conduit directly below concrete sidewalks, however, conduit must be buried **18 inches 450 mm** deep at point of exit from planting areas.
- 10. Conduit And Raceway Support:
 - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
 - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
 - 1) Expansion shields in concrete or solid masonry.
 - 2) Toggle bolts on hollow masonry units.
 - 3) Wood screws on wood.
 - 4) Metal screws on metal.
- 11. Prohibited Procedures:
 - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
 - b. Installation of raceway that has been crushed or deformed.
 - c. Use of torches for bending PVC.
 - d. Spray applied PVC cement.
 - e. Boring holes in truss members.
 - f. Notching of structural members.
 - g. Supporting raceway from ceiling system support wires.
 - h. Nail drive straps or tie wire for supporting raceway.

D. Telephone / Data Systems:

1. Install main service raceway as directed by Telephone Company. Leave pull wire in raceway.
2. Install raceway from terminal board to each telephone and data outlet unless indicated otherwise on Drawings.

E. Boxes:

1. Boxes shall be accessible and installed with approved cover.
2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
4. Install outlets flush with finished surface and level and plumb.
5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
7. Location:
 - a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be within **6 inches 150 mm** of door jamb.
 - b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.

- c. Center ceramic tile boxes in tile.
- F. Support factory-fabricated speaker enclosures from structure or ceiling suspension system.

END OF SECTION

SECTION 26 06 13**ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE****PART 1 - GENERAL: Not Used****PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.
- B. Mounting Heights:
 - 1. HVAC:
 - a. Temperature Control Junction Boxes: As indicated on Drawings.
 - b. Thermostats: As indicated on Drawings.
 - c. Remote Temperature Sensors:
 - 1) Wall-Mounted 56 inches 1 400 mm to top.
 - d. Other Motor Disconnects: 60 inches 1 500 mm.
 - e. Motor Controls: 60 inches 1 500 mm.
 - 2. Plumbing:
 - a. Electric Water Cooler Outlets: Mount so outlet and cord are hidden by water cooler.
 - 3. Electrical:
 - a. Distribution Panels: 72 inches 1 800 mm to top.
 - b. Receptacles: 18 inches 450 mm.
 - c. Wall Switches: 42 inches 1 050 mm.
 - d. Wall-Mounted Exit Lights: 90 inches 2 250 mm.
 - e. Emergency Lighting Units: 60 inches 1 500 mm.
 - 4. Communications:
 - a. Sound Distribution System Components: As indicated on Drawings.
 - b. Satellite Distribution System Components: As indicated on Drawings.
 - c. TV Distribution System Components: As indicated on Drawings.
 - d. Computer and TV: 18 inches 450 mm.
 - e. Telephone / Data Terminal Boards: 72 inches 1 800 mm to top.
 - f. Telephones (wall type): 48 inches 1 200 mm.
 - g. Telephones (desk type): 18 inches 450 mm.
 - h. Signal Chimes: 84 inches 2 100 mm.

END OF SECTION

SECTION 26 24 17**CIRCUIT-BREAKER PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 EQUIPMENT**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Pittsburgh, PA www.eatonelectric.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Siemens Energy & Automation, Alpharetta, GA www.sea.siemens.com.
 - d. Square D Co, Palatine, IL www.us.squared.com.
- B. Performance:
 - 1. Capacities:
 - a. Panelboard:
 - 1) Minimum integrated equipment short circuit rating of 22,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 50,000 amperes for 277 / 280 Volts.
 - 3) Rated for use as service entrance equipment.
 - b. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 10,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 14,000 amperes for 277 / 480 Volts.
 - c. Load Centers:
 - 1) 125 Amp main lugs, 120 / 208 Volt, three-phase.
 - 2) Minimum integrated equipment short circuit rating of 10,000 Amps.
- C. Material:
 - 1. Circuit-breaker type.
 - 2. Galvanized steel cabinets
 - 3. Bussing and lugs arranged as required.
 - 4. Multi-pole circuit-breakers shall be common trip.
 - 5. Circuit-breakers shall be molded case thermal magnetic type with inverse time characteristics.
 - 6. Main Panelboard:
 - a. Surface-mounted and front accessible.
 - b. Enclosures:
 - 1) NEMA / CEMA Type 1.
 - c. Minimum dimensions of 32 inches 800 mm wide by 8 inches 200 mm deep.
 - d. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 100 Amp, three-pole circuit-breaker.

- e. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Type PRL4B by Cutler-Hammer.
 - 2) Spectra Series by General Electric.
 - 3) Type P4 by Siemens.
 - 4) I-Line by Square D.
- 7. Lighting And Appliance Panelboards:
 - a. Plug-on or bolt-on breakers. Multi-pole breakers shall be common trip.
 - b. Cabinets shall be locking type with no exposed latches or screws when door is closed. Key panels alike and provide minimum of three keys.
 - c. Minimum dimensions of **20 inches 500 mm** wide by **5-3/4 inches 144 mm** deep.
 - d. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 20 Amp, single-pole circuit-breaker.
 - e. Breakers specified to be shunt trip and shall include shunt trip accessories to remotely trip breaker using separate 120 V power source. Trip coil shall include coil-clearing contact to break coil current when breaker opens.
 - f. Use equipment from same manufacturer as main panelboard.
 - g. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Type PRL1a by Cutler-Hammer.
 - 2) Type AL or AQ by General Electric.
 - 3) Type P1 by Siemens.
 - 4) Type NQOD by Square D.
- 8. Load Centers:
 - a. Surface-mounted, outdoor NEMA Type 3R enclosure with padlocking provisions. **12-1/2 inches 318 mm** wide by 4-1/2 inches 115 mm deep minimum.
 - b. HACR type circuit breakers.
 - c. Use equipment from same manufacturer as main panelboard.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Type CH by Cutler-Hammer.
 - 2) Type PowerMark Plus by General Electric.
 - 3) Type EQ by Siemens.
 - 4) Type QO by Square D.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Label panelboards, and each breaker in main panelboard with **1/16 inch 1.5 mm** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch 6 mm** high.
- B. Provide typewritten circuit schedules in lighting and distribution panelboards to identify panelboard and load served by each branch breaker.
- C. Arrange conductors neatly within panelboards and load centers.
- D. Secure to structure in accordance with requirements of Project seismic design category.

3.2 PROTECTION

- A. Protect panelboards, and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION

SECTION 26 27 26**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wiring devices complete with plates as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cooper Wiring Devices, Peachtree City, GA www.cooperwiringdevices.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Hubbell Building Automation, Austin, TX www.hubbell-automation.com.
 - d. Hubbell Inc, Milford, CT www.hubbell-wiring.com.
 - e. Hunt Control Systems Inc, Fort Collins, CO www.hundimming.com.
 - f. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - g. Leviton Manufacturing Co, Little Neck, NY www.leviton.com.
 - h. Lightolier Controls, Dallas, TX www.lolcontrols.com.
 - i. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - j. Novitas Inc, Peachtree City, GA www.novitas.com.
 - k. Ortronics, New London, CT www.ortronics.com.
 - l. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon.
 - m. Pass & Seymour, Syracuse, NY www.passandseymour.com.
 - n. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - o. Siemon Company, Watertown, CT www.siemon.com.
 - p. Square D Co, Palatine, IL www.squared.com.
 - q. Suttle, Hector, MN www.suttleonline.com.
 - r. Tork Inc, Mount Vernon, NY www.tork.com.
 - s. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - 2. Product Options:
 - a. Faces shall be nylon where available.
 - b. Devices of single type shall be from same Manufacturer.
 - c. Devices are listed as white. Use white devices on light colored walls and brown on dark walls.
- B. Switches:
 - 1. Rectangular Face Designer Style:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) 20 AMP, single pole:
 - a) Cooper: DECB120W.
 - b) Hubbell: HBL2121WA.
 - c) Leviton: 5621-2W.
 - d) Pass & Seymour: 2621-W.
 - 2) Two Pole:
 - a) Cooper: DECB220W.

- b) Hubbell: HBL2122WA.
 - c) Leviton: 5622-2W.
 - d) Pass & Seymour: 2622-W.
 - 3) Three Way:
 - a) Cooper: DECB320W.
 - b) Hubbell: HBL2123WA.
 - c) Leviton: 5623-2W.
 - d) Pass & Seymour: 2623-W.
 - 4) Four Way:
 - a) Cooper: DECB420W.
 - b) Hubbell: HBL2124WA.
 - c) Leviton: 5624-2W.
 - d) Pass & Seymour: 2624-W.
- 2. Exhaust Fan Timer Switches:
 - a. Rest Rooms and Mother's Room:
 - 1) 0-15 minute, no hold position.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: FD15MWC.
 - b) Paragon: SWD15M-W.
 - c) Tork: A515MW.
 - b. Font:
 - 1) 0-4 Hour, no hold position.
 - 2) Approved Products:
 - a) Intermatic: FDHW.
 - b) Tork: A504HW.
 - c. Custodian Room:
 - 1) 24 hour, in-wall, multiple automatic ON-OFF settings.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: E1020.
 - b) Tork: 701A.
- 3. Dimmer Switches:
 - a. Vertical slide control with faceplate.
 - b. Preset, ON-OFF switch, 1000VA.
 - c. Approved Products:
 - 1) Hubbell: AS101/AS1I.
 - 2) Hunt: DAP-10-IV.
 - 3) Leviton: IPI10-I
 - 4) Lightolier: MP1000-I.
 - 5) Lutron: N-1003P-IV.
 - 6) Pass & Seymour: 91180-I.

- C. Receptacles:
- 1. Rectangular Face Designer Style:
 - a. 15 AMP, specification grade, back and side wired, self grounding.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 6262W.
 - 2) Hubbell: HBL2152WA.
 - 3) Leviton: 16252-W.
 - 4) Pass & Seymour: 26252-W.
- 2. Ground Fault Circuit Interrupter (GFCI):
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
- 3. Basketball Standard Receptacle:
 - a. Three pole, four wire grounding, 125 / 250V, locking type, NEMA L14-20R, 20 AMP, complete with plate.

- b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: CWL1420R
 - 2) Hubbell: HBL2410
 - 3) Leviton: 2410
 - 4) Pass & Seymour: L1420-R
- D. Telephone Jacks:
 - 1. Desk Type:
 - a. 4 conductor, screw terminals, voice grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 3532-4W.
 - 2) Leviton: 40249-W.
 - 3) Pass & Seymour: TPTE1-W.
 - 4) Suttle: 625B4-4-85.
 - 2. Wall Type:
 - a. 4 conductor, screw terminals, voice grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 3521-4W.
 - 2) Leviton: 40257-W.
 - 3) Pass & Seymour: WMTE14-W.
 - 4) Suttle: 630AC4-85.
 - 3. Module Type:
 - a. For use in data faceplates.
 - b. 8 conductor, punch-down, voice grade.
 - c. Type Two Acceptable Products:
 - 1) Siemon: MX3-F-U3-02
 - 2) Equal as approved by Architect before use. See Section 01 6200.
- E. Data Jacks:
 - 1. For use in data faceplates.
 - 2. 8 conductor, punch-down T568B wiring configuration, CAT 5e.
 - 3. Type Two Acceptable Products:
 - a. Flat Jack: Siemon MX5-F02
 - b. Angled Jack: Siemon MX5-02
 - c. Equal as approved by Architect before use. See Section 01 6200.
- F. Plates:
 - 1. Standard Cover Plates:
 - a. Office / Occupied Areas:
 - 1) Nylon or high impact resistant thermoplastic.
 - 2) Color shall match wiring device.
 - b. All Other: Stainless Steel.
 - c. Ganged switches shall have gang plates.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
 - 2. Data Faceplates:
 - a. Type Two Acceptable Products:
 - 1) Single Module: Siemon MX-FP-S-01-02.
 - 2) Two Modules: Siemon MX-FP-S-02-02.
 - 3) Equal as approved by Architect before use. See Section 01 6200.
 - 3. Weatherproof In-Use Receptacle Covers:
 - a. NEMA 3R rated.
 - b. Cast aluminum.
 - c. Compatible with GFCI receptacles.
 - d. Complete with weather resistant gaskets and stainless steel screws.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Hubbell: WP26MH, horizontal; WP26M, vertical.

- 2) Intermatic: WP1010HMC, horizontal; WP1010MC, vertical.
- 3) Red Dot: CKMG, horizontal; CKMGV, vertical.

G. Occupancy Sensors:

1. Ceiling, ultrasonic type.
 - a. Complete with sensor and combined relay / control transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Leviton:
 - a) Sensor: OSC10-U
 - b) Relay / Transformer: OSP20-OD
 - 2) Hubbell:
 - a) Sensor: OMNI-US500.
 - b) Relay / Transformer: 120 V: MP 120 A or 277 V: MP 277 A.
 - 3) Novitas:
 - a) Sensor: 01-083.
 - b) Relay / Transformer: 120 / 277 V, 13-0511.
 - 4) Pass & Seymour: 120 V.
 - a) Sensor: US1001.
 - b) Relay / Transformer: PWP120.
 - 5) Tork:
 - a) Sensor: SC20.
 - b) Relay / Transformer: 120 V: TRP1 or 277 V: TRP2.
 - 6) Watt Stopper:
 - a) Sensor: W-500A.
 - b) Relay / Transformer: 120 V: B120E-P or 277 V: A277E-P.

H. Data Patch Panel:

1. Panel:
 - a. Meet requirements of TIA / EIA 568 Standard.
 - b. CAT 5e, 48 ports groups in eight 6-port modules, T568B wiring configuration, **19 inch 475 mm** width.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 5548.
 - 2) Leviton: 5G548-U48.
 - 3) Ortronics: OR-851004038.
 - 4) Suttle: 2-7032-48.
2. Mounting Bracket:
 - a. Hinged, wall mounted, 19 inches wide by 5 inches deep.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Cooper: 5549-2.
 - 2) Leviton: 49251-W62.
 - 3) Ortronics: OR-604004068.
 - 4) Suttle: 103B1.

I. Secondary Surge (Lightning) Arresters:

1. Protection from Category C level transient surges as defined in IEE / ANSI C62.11 and C62.41. UL approved for exterior application.
2. Parallel metal oxide varistors, MOV, from each line to ground. 120 / 240 VAC. UV resistant construction with epoxy encapsulation of electrical connections.
3. Include 1/2 inch mounting nipple and locknut.
4. Category Four approved Products. See Section 01 6200 for definitions of Categories.
 - a. ASZ175B2 by Cooper Power Systems.
 - b. 9L15FCB001 by General Electric.
 - c. AG2401C by Intermatic.
 - d. 54175-SSA by Leviton.
 - e. SDSA1175 by Square D.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install devices flush with walls, straight, and solid to box.
- B. Label dimmer switch groupings with **1/16 inch 1.5 mm** thick laminated plastic composition material with contrasting color core. Engraved letter shall be **1/4 inch 6 mm** high.
- C. Install secondary surge arrestor in knock-out of junction box installed on bottom of automatic sprinkler controller.

END OF SECTION

SECTION 26 28 16**ENCLOSED SWITCHES AND CIRCUIT BREAKERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Disconnects: Same as Manufacturer of Project's main panelboard.
 - b. Fuses.
 - 1) Cooper Bussmann, Ellisville, IL www.cooperbussmann.com.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL www.littelfuse.com.
- B. Disconnects:
 - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
 - 2. Provide interlock to prevent opening of door when switch is in ON position.
 - 3. Provide means to lock switch in OFF position with padlock.
 - 4. Disconnects for motor circuits shall be horsepower rated
 - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
 - 6. Enclosures:
 - a. Interior: NEMA / CEMA Type 1.
 - b. Exterior: NEMA / CEMA Type 3R.
 - 7. Fuses:
 - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
 - b. Fuses on Project shall be from single manufacturer.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch 1.5 mm** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch 6 mm** high. Attach labels with screws.

END OF SECTION

SECTION 26 29 13**ENCLOSED CONTROLLERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install motor starters and thermal units as described in Contract Documents, except those furnished as integral part of mechanical equipment.
- B. Related Requirements:
 - 1. Division 23: Motor starters and thermal units included as part of mechanical equipment.
 - 2. Section 26 0501: Common Electrical Requirements

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturer. See Section 01 6200 for definitions of Categories.
 - a. Same manufacturer as Project's main panelboard.
- B. Material:
 - 1. Motor Starters:
 - a. General:
 - 1) Full voltage magnetic type rated in accordance with NEMA / CEMA standards, sizes, and horsepower ratings. Each starter shall include 100 VA control transformer rated 120/24 v. Fuse as required for class 2 wiring.
 - 2) Provide auxiliary contacts as required by Division 15.
 - 3) Provide solid state overload protection which includes but is not limited to:
 - a) Phase unbalance and phase loss protection.
 - b) Visible trip indication.
 - c) Trip test function.
 - d) Current adjustment over full range if starter's capacity.
 - e) Adjustment dial tamper guard.
 - 4) HAND-OFF-AUTO selector switch.
 - b. Include for Single Speed Starters:
 - 1) Red run light.
 - c. Include for Two Speed Starters:
 - 1) Designed for separate winding variable torque motors.
 - 2) High / low push button switch to select fan speed when operating in hand mode.
 - 3) Green high and red low speed run lights. Lights shall also be labeled.
 - 4) Separate overload units for high and low speed windings.
 - 5) Mechanical interlocks to prevent engaging both windings simultaneously.
 - 6) Provide time delay relay adjustable from 15 seconds to one minute for delay of starting motors when changing speeds.
 - d. Include for Duplex Motor Starters:
 - 1) Alternate operation of each pump upon each successive starting.
 - 2) Starting of second motor upon shutdown or failure of running motor.
 - 3) Red run lights for each motor.
 - 4) Wiring for control from single pole pilot device.
 - 5) Receive power supply for both motors from single feeder. Under no conditions shall both motors run simultaneously.

2. Enclosures: When not installed in motor control center, provide NEMA / CEMA Type 1 or, where required to be weatherproof, NEMA / CEMA Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work: Coordinate with appropriate Sections of Divisions 23 to determine necessary auxiliary contacts.
- B. Size overload units based on nameplate full load current of actual motors installed.
- C. Install each overload unit so catalog number is visible.
- D. If starter is mounted separate from disconnect, provide label on starter indicating equipment served, such as Condensing Unit CU-1. Use **1/16 inch 1.6 mm thick** laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch 6 mm**.

END OF SECTION

SECTION 26 51 00**INTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Advance Transformer Co, Rosemont, IL www.advancetransformer.com.
 - b. General Electric Lighting, Hendersonville, NC www.gelighting.com/na.
 - c. Howard Lighting Products, Laurel, MS www.howard-ind.com.
 - d. Novitas Inc, Peachtree City, GA www.novitas.com.
 - e. Osram Sylvania, Danvers, MA www.sylvania.com.
 - f. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam.
 - g. Universal Lighting Technologies, Nashville, TN www.universalballast.com.
 - h. Venture Lighting International, Solon, OH www.venturelighting.com.
 - i. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - j. Westinghouse Lighting Corp, Philadelphia, PA www.westinghouselightbulbs.com.
 - 2. Product Options: When several lighting fixtures are specified by name for one use on Drawings, select any one of those specified. Do not mix fixtures from different manufacturers specified for one use.
- B. Materials
 - 1. Lighting Fixtures:
 - a. Type One Acceptable Products:
 - 1) See Fixture Schedule on Drawings for acceptable manufacturers and models.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.
 - 2. Led Light Fixtures:
 - a. General.
 - 1) LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on drawings, and as specified.
 - 2) LED light fixture shall be Reduction of Hazardous Substances (RoHS)-compliant.
 - 3) LED drivers shall include the following features unless otherwise indicated:
 - a) Minimum efficiency: 85% at full load.
 - b) Minimum Operating Ambient Temperature: -20°C. (-4°F.)
 - c) Input Voltage: 120-277V ($\pm 10\%$) at 60Hz.
 - d) Integral short circuit, open circuit, and overload protection.
 - e) Power Factor: ≥ 0.95 .
 - f) Total Harmonic Distortion: $\leq 20\%$.
 - g) Comply with FCC 47 CFR Part 15.
 - 4) LED Modules shall include the following features unless otherwise indicated:
 - a) Comply with IES LM-79 and LM-80 required.

- b) Minimum CRI80 and color temperature 3000K unless otherwise specified in Lighting Fixture Schedule.
- c) Minimum Rated Life: 50,000 hours per IES L70.
- d) Light output lumens as indicated in the Lighting Fixture Schedule.
- b. LED Downlights:
 - 1) Housing, LED driver, and LED module shall be products of the same manufacturer.
- c. LED Troffers:
 - 1) LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
 - 2) Housing, LED driver, and LED module shall be products of the same manufacturer.
- C. Factory Assembly:
 - 1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, drivers, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling.
 - 2. Coordinate with Sections under 09 9000 heading to ensure that light coves are properly painted before installation of light fixtures.
 - 3. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.
- B. Securely mount fixtures. Support fixtures weighing **50 lbs 23 kg** or more from building framing or structural members.
- C. Fasten lay-in fixtures to ceiling suspension system on each side with bolts, screws, rivets, or clips. In addition, connect lay-in fixtures weighing less than **50 lbs 23 kg** with two-wire hangers minimum to building framing or structural members. Connect wires to opposing corners of fixture and may be slightly slack. Make final conduit connections to lay-in fixtures with specified flexible conduit or flexible fixture whips.
- D. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.
- E. Do not locate fixtures in closet or storage areas within **18 inches 450 mm** and fixtures within **6 inches 150 mm** of shelves.

3.2 ADJUSTMENT

- A. Repair scratches or nicks on exposed surfaces of fixtures to match original undamaged conditions.

END OF SECTION

SECTION 26 52 00**EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Bodine Emergency Lighting, Collierville, TN www.bodine.com
 - b. Dual-Lite, Cheshire, CT www.dual-lite.com.
 - c. Iota Engineering Co, Tucson, AZ www.iotaengineering.com
 - d. Lightolier, Fall River, MA www.lightolier.com.
 - e. Lithonia Lighting, Conyers, GA www.lithonia.com.
 - f. McPhilbin / Day-Brite Lighting, Tupelo, MS www.mcphilben.com.
 - g. Sure-Lites / Cooper Lighting, Elk Grove, IL www.cooperlighting.com.
- B. Materials:
 - 1. Battery Packs:
 - a. General:
 - 1) Batteries shall be long life nickel cadmium type.
 - 2) Complete with charging indicator light and test switch.
 - 3) Factory-installed in lighting fixture, or capable of being field-installed to same standards.
 - b. Standard Linear Fluorescent Fixtures:
 - 1) Shall operate one lamp of fluorescent lighting fixture at approximately 600 lumens initially and 60 percent minimum of initial lumens after 90 minutes.
 - 2) Charger shall be capable of full recharge in 24 hours.
 - c. Recessed Downlight Fluorescent Fixtures:
 - 1) Shall operate lamp(s) of lighting fixture for 90 minutes minimum.
 - 2) Components shall be easily accessible for maintenance.
 - 2. Emergency Lighting Units And Remote Lighting Heads:
 - a. Shall operate indicated number of lamps for 90 minutes of emergency operation.
 - b. Sealed, maintenance free, lead calcium type battery.
 - c. Painted steel housing and complete with power indicator light and test switch.
 - d. Lamps shall be 12 Watt, 12 Volts in metal housing designed for wet locations and with mounting plate that allows full vertical and horizontal adjustment of lamps.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - 1) Sure-Lites / Cooper Lighting:
 - a) No Lamp Unit: XR12208-0-SD.
 - b) Remote Two Lamp Lighting Head: 12T-12-DWMHWH.
 - 2) Dual-Lite:
 - a) No Lamp Unit: LM66-12V-0.
 - b) Remote Two Lamp Lighting Head: OMSDW1212.
 - 3) Lightolier:

- a) No Lamp Unit: E4250LW.
- b) Remote Two Lamp Lighting Head: MP2(2)CH1212.
- 4) Lithonia Lighting:
 - a) No Lamp Unit: ELT50WRO.
 - b) Remote Two Lamp Lighting Head: ELATMTH1212.
- 5) McPhilbin / Day-Brite Lighting:
 - a) No Lamp Unit: ES12L-50W.
 - b) Remote Two Lamp Lighting Head: (2)MCE-MP2W.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Battery Packs:
 - 1. General:
 - a. Wire so unit can be tested with lights on.
 - b. Wire so lamps in normal mode are switched off with other lighting in area. Connect unit to unswitched conductor of normal lighting circuit.
 - 2. Recessed Downlight Fluorescent Fixtures: If indicator light and test switch cannot be installed within fixture, install on plate adjacent to fixture.
 - 3. Other Fluorescent Fixtures: Install in ballast channel of fixture with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens.

END OF SECTION

SECTION 26 56 00**EXTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exterior lighting system as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts.
- C. Related Requirements:
 - 1. Section 03 3053: Concrete bases for light poles and installation of anchor bolts.
 - 2. Section 26 0501: Common Electrical Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Milwaukee, WI www.cutler-hammer.eaton.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - d. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon.
 - e. Siemens Energy & Automation, Alpharetta, GA www.sea.siemens.com.
 - f. Square D Co, Palatine, IL www.squared.com.
 - g. Tork Inc, Mount Vernon, NY www.tork.com.
- B. Materials:
 - 1. Exterior Fixtures:
 - a. Finish shall meet requirements of AAMA 603.8 for baked-on organic coating, AAMA 605.2 high performance organic coating, or AAMA Architectural Class I anodizing as necessary to provide specified color.
 - b. Color shall be Manufacturer's standard white, natural aluminum, or medium bronze as selected by Architect before bidding.
 - c. Type One Acceptable Products:
 - 1) As indicated on Fixture Schedule. Do not mix fixtures from different manufacturers for one use.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.
 - 2. Parking Area Poles:
 - a. Designed for wind loading required for Project location as determined by Architect.
 - b. Aluminum hinged base type with matching aluminum anchor bolt cover secured to base.
 - c. Include hand hole with cover at pole base.
 - d. Finish And Color: Match parking area fixtures.
 - 3. Exterior Lighting Control:
 - a. Time Switch:
 - 1) Standard 24-hour dial time switch, 120 volts, NEMA 1 enclosure.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: T101.
 - b) Paragon: 4001-00.
 - c) Tork: 1101.

- b. Photo Cell:
 - 1) 120 volts.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Intermatic: K4121.
 - b) Paragon: CW201-00.
 - c) Tork: 2101.
- c. Lighting Contactor:
 - 1) 120 volt coil, 20 amps, 2 pole, NEMA 1 enclosure.
 - 2) By same manufacturer as main panelboard.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Cutler Hammer: CN35.
 - b) General Electric: CR260L-21CA22.
 - c) Siemens: CLH1B4212A803.
 - d) Square D: Class 8903, Type LG-20.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work: Coordinate location of anchor bolts and conduit in concrete bases so pole will be properly mounted and centered on base.
- B. Lighting Control:
 - 1. Install time switches, manual bypass switches, and contactor inside building to control parking area and building exterior lighting. Label each component to identify lighting controlled, I.E. 'PARKING LIGHTING' or 'BUILDING LIGHTING.' Label with **1/16 inch 1.5 mm** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch 6 mm** high.
 - 2. Locate photocell outside building under soffit and away from any light source and direct sunlight.
 - 3. Wire photocell and time switch in series for photo cell ON, time switch OFF operation.

3.2 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 - 1. Before Substantial Completion, meet with personnel designated by Owner to:
 - a. Identify location of control system components.
 - b. Explain operation of each component.
 - c. Demonstrate adjustment capabilities of time clocks, including turning systems OFF at times other than sunrise and keeping systems OFF on days facility is closed.
 - d. Set time clocks as directed.

END OF SECTION