

**PROJECT MANUAL
CONSTRUCTION DOCUMENTS**



**SOUTH POINT HIGH SCHOOL
ATHLETIC PROGRAM RENOVATIONS
ROCK HILL, SOUTH CAROLINA**

RHS SOLICITATION #17-1829

DOCUMENT 000110 - TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

001113	Notice to Bidders
002113	AIA A701 Instructions to Bidders
004113	Bid Form – Stipulated Sum (Single-Prime Contract)
004115	AIA A310 Bid Bond
005200	AIA A105 Owner-Modified Standard Form of Agreement Between Owner and Contractor
006313	Contractor's RFI Form
006325	Contractor's Request for Substitution Form

DIVISION 01 – GENERAL REQUIREMENTS

011000	Summary
012100	Allowances
012600	Contract Modification Procedures
012900	Payment Procedures
013100	Project Management and Coordination
013200	Construction Progress Documentation
013300	Submittal Procedures
014000	Quality Requirements
014200	References
015000	Temporary Facilities and Controls
016000	Product Requirements
017000	Execution and Closeout Procedures
017300	Execution Requirements
017329	Cutting and Patching
017700	Closeout Procedures
017823	Operations and Maintenance Data

DIVISION 02 – EXISTING CONDITIONS

024119	Selective Demolition
--------	----------------------

DIVISION 03 – CONCRETE

033000	Cast-in-Place Concrete
--------	------------------------

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

061000	Miscellaneous Rough Carpentry
--------	-------------------------------

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

079200	Joint Sealants
--------	----------------

DIVISION 08 – OPENINGS

081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors
087100	Door Hardware
089000	Louvers

DIVISION 09 – FINISHES

092900	Gypsum Board
093000	Tiling
095113	Acoustical Panel Ceilings
096513	Resilient Base and Accessories
099123	Interior Painting
099600	High Performance Coatings

DIVISION 10 – SPECIALTIES

102800	Toilet Accessories
104400	Fire Protection Specialties

DIVISION 22 – PLUMBING

220500	General Plumbing Requirements
220501	Common Plumbing Materials
220601	Hydronic Specialties
220719	Plumbing Piping Insulation
223300	Electric Water Heaters
224011	Plumbing Accessories
224100	Plumbing Fixtures: Sinks and Lavatories
224300	Plumbing Fixtures: Water Closets and Urinals

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

230501	General HVAC Requirements
230502	Common HVAC Materials
230700	HVAC Insulation
230719	HVAC Piping Insulation
230900	Instrumentation and Controls for HVAC (General)
230900.01	Controls for HVAC (Dampers & Valves)
230904.02	Building Automation System (LON System)
230993	Sequence of Operations for HVAC Controls and Points List
230993.02	Sequence of Operations Air Handling Equipment

DIVISION 26 – ELECTRICAL

260500	Electrical General Requirements
260519	Wire and Cable
260533	Metallic Conduits/Raceways and Fittings
260534	Rigid Non-Metallic (PVC) Conduits/Raceways and Fittings
260923	Automatic Lighting Control
262200	Dry Type Transformers
262416	Panelboards
265100	Lighting

END OF DOCUMENT 000110

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

DOCUMENT 001113 - NOTICE TO BIDDERS

Project Name: South Pointe High School Athletic Renovations
Bid Number 17-1829

Project Location: South Pointe High School, 801 Neely Road, Rock Hill, SC 29730

Owner: Rock Hill Schools

DESCRIPTION OF PROJECT:

South Pointe High School Athletic Renovations scope of work includes newly created space for the Baseball and Softball teams within the existing Jewell Building on the South Pointe High School campus. The existing storage space will be divided by new partitions to create storage space for the teams and restrooms will be added. The work includes, but is not limited to, select demolition, concrete slab work, masonry, windows, doors, interior finishes, and all structural, mechanical (plumbing, HVAC), and electrical work necessary to complete the project.

BID SUBMITTAL AND BID SECURITY:

The Owner will consider bids pursuant South Carolina ST SEC 11-35 prepared in compliance with the Instructions to Bidders, and delivered as follows:

Bid Date: July 19, 2018

Bid Time: 2:00 PM

Bid Location: Rock Hill School District, Facilities Services, 2171 W Main St., Rock Hill, SC 29732

Bids will be thereafter publicly opened and read aloud. Bid security shall be submitted with each bid in the amount of **5** percent of the bid amount. No bids may be withdrawn for a period of **60** days following opening of bids. The Owner reserves the right to reject any and all bids and to waive minor informalities and irregularities.

PRE-BID CONFERENCE:

A non-mandatory pre-bid conference for all bidders will be held at RHSD Facilities Building on July 10, 2018 at 9:00 a.m. local time. Prospective prime bidders are requested to attend. Subcontractors and suppliers are invited to attend. A walkthrough of the existing building will take place following the conference.

ELECTRONIC BIDDING DOCUMENTS (PDFs):

Complete Contract Documents can be obtained electronically through [Vendor Registry](#). Vendors are encouraged to register with Vendor Registry. Registration for Rock Hill Schools is FREE. If you have problems downloading the documents, contact Kathy Fletcher, kfletcher@jmcope.com, (803) 981-5019.

SUBSTANTIAL COMPLETION & FINAL COMPLETION:

Work shall be final within 30 days of substantial completion.

LIQUIDATED DAMAGES:

Work is subject to Liquidated Damages indicated in the Contract Documents and/or Bid Form.

BIDDER'S QUALIFICATIONS

Bidders must be properly licensed under the state laws governing their respective trades appropriate to the size of the Project. A Performance Bond, separate Labor and Material Payment Bond, and Insurance in a form

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

acceptable to the Owner will be required of the successful Bidder. Bidders and their subcontractors shall meet qualification requirements indicated in the Contract Documents.

Submission of a bid shall serve as evidence that the Bidder has confirmed that the Bidder is properly qualified to perform the work and is capable of obtaining the required bonds and insurance. Bidders shall, if requested, submit evidence in affidavit form of applicable experience, licensure, approvals, and certifications, adequate financial resources, work in hand capacity, adequate organization, and acceptable past performance. Submittal will be in the form of AIA Document A305 *Contractor's Qualification Statement*. Bidder's qualification information shall be considered privileged and confidential. Each bid is also subject to the Responsibility requirements of §1810 of the Owner's Procurement Code.

END OF DOCUMENT 001113



AIA[®]

Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address)

South Pointe High School Athletic Project Renovation & Addition

THE OWNER:

(Name, legal status and address)

Rock Hill Schools (York District 3)

1234 Flint St. Extension

Rock Hill, SC 29730.

THE ARCHITECT:

(Name, legal status and address)

TABLE OF ARTICLES

- | | |
|---|--|
| 1 | DEFINITIONS |
| 2 | BIDDER'S REPRESENTATIONS |
| 3 | BIDDING DOCUMENTS |
| 4 | BIDDING PROCEDURES |
| 5 | CONSIDERATION OF BIDS |
| 6 | POST-BID INFORMATION |
| 7 | PERFORMANCE BOND AND PAYMENT BOND |
| 8 | FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR |

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Complete Contract Documents can be obtained electronically through Vendor Registry (see link below).
<https://vrapp.vendorregistry.com/Vendor/Register/Index/rock-hill-school-district-three-sc-vendor-registration>
Registration for Rock Hill Schools is FREE.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Owner at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

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

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

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

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

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

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

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

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

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "NO CHANGE."

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

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

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

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

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

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and

time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

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

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Owner, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner in writing:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Owner will notify the Bidder in writing if the Owner, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in

cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

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

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

Additions and Deletions Report for AIA® Document A701™ – 1997

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 08:20:46 on 04/24/2018.

PAGE 2

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the ~~number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.~~number.

PAGE 3

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the ~~Architect~~Owner at least seven days prior to the date for receipt of Bids.

...

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

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

PAGE 4

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "~~No Change.~~"NO CHANGE."

PAGE 5

Bidders to whom award of a Contract is under consideration shall submit to the ~~Architect~~Owner, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

...

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner ~~through the Architect~~ in writing:

...

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the ~~Architect and~~ Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

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

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

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION (**OWNER PROJECT NO. 17-1829**)

- A. Bidder: _____.
- B. Project Name: South Pointe High School Athletic Renovations
Bid Number 17-1829
Project Location: South Pointe High School, 801 Neely Road, Rock Hill, SC 29730
- C. Owner: Rock Hill Schools (York County District 3)

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by the Owner's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars (\$_____).

The above sum includes the Base Bid and all Allowances.

Allowance #1	\$15,000.00
Allowance #2	\$10,000.00
Allowance #3	\$5,000.00
Allowance #4	<u>\$5,000.00</u>
Total Allowances	\$35,000.00

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within **10** days after a written Notice of Award, if offered within **30** days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____ Dollars (\$_____).

- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS AND SUPPLIERS – Contractor to provide the name of subcontractor(s) listed below.

A. IT IS THE BIDDER'S RESPONSIBILITY TO DETERMINE THAT EVERY SUBCONTRACTOR LISTED HEREUNDER HOLDS ANY NECESSARY LICENSE(S) AT THE TIME OF BID OPENING. THE DISTRICT VERIFIES THIS INFORMATION AS PART OF ITS RESPONSIBILITY AND RESPONSIVENESS DETERMINATIONS PRIOR TO THE ISSUANCE OF ANY NOTICE OF INTENT TO AWARD.

B. The following companies shall execute subcontracts for the portions of the Work indicated:

1. Plumbing: _____

2. HVAC: _____

3. Electrical: _____

1.5 TIME OF COMPLETION – Contractor to provide proposed duration of work.

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by the client, and shall fully complete the Work according to the following:

1. Substantial Completion: 120 calendar days from the Notice to Proceed

2. Final Completion: 30 calendar days from the date of Substantial Completion

1.6 LIQUIDATED DAMAGES

Owner and Contractor recognize that time is of the essence to this Agreement and that the Owner will suffer financial loss if the Work is not completed within the Contract Time. Both Parties also recognize the delays, difficulties and expense involved in proving, in a legal proceeding, the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, in lieu of requiring such proof, the Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor, and the Contractor's surety if any, shall pay to the Owner for each day in excess of the Contract Time the amount of \$500.00 per calendar day as liquidated damages. Said liquidated damages shall not be construed as constituting a claim or award for consequential damages.

1.7 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1.	_____	_____	Initial here to acknowledge receipt
2.	_____	_____	Initial here to acknowledge receipt
3.	_____	_____	Initial here to acknowledge receipt

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

1.8 PERFORMANCE AND PAYMENT BONDS

- A. Unless otherwise provided in the bid documents, PERFORMANCE and LABOR AND MATERIAL PAYMENT BONDS, each in the amount equal to one hundred percent (100%) of the contract price for the Base Bid shall be required of the successful bidder if the contract is awarded.

1.9 DRUG-FREE WORKPLACE

- A. The undersigned certifies to the District that it will provide a Drug-Free Workplace, as required by Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

1.10 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.11 SUBMISSION OF BID

- A. Respectfully submitted this _____ day of _____, 2018.
- B. Submitted By: _____
(Name of bidding firm or corporation)
- C. Authorized Signature: _____ (Handwritten signature).
- D. Signed By: _____
(Type or print name) (Title: Owner/Partner/President/Vice President)
- E. Witness By: _____ (Handwritten signature).
- F. By: _____
(Type or print name) (Title: Corporate or Assistant Secretary)
- G. Street Address: _____
- H. City, State, Zip: _____
- I. Phone: _____ Email: _____
- J. License No.: _____ Federal ID No.: _____

END OF DOCUMENT 004113

**AIA**[®]

Document A310[™] – 2010

Bid Bond

CONTRACTOR:*(Name, legal status and address)***SURETY:***(Name, legal status and principal place of business)***OWNER:***(Name, legal status and address)***BOND AMOUNT: \$****PROJECT:***(Name, location or address, and Project number, if any)*

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

(Contractor as Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)



AIA® Document A105™ – 2007

Standard Form of Agreement Between Owner and Contractor for a Residential or Small Commercial Project

AGREEMENT made as of the X day of July in the year 2018
(In words, indicate day, month and year.)

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

Rock Hill Schools
2171 West Main Street
Rock Hill, SC 29732

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

GENERAL CONTRACTOR

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

RHS Bid #17-1829 , South Pointe High School Athletic Renovations
South Pointe High School
801 Neely Road
Rock Hill, SC 29730

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

NOT APPLICABLE TO THIS WORK

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

State or local law may impose requirements on contracts for home improvements. If this document will be used for Work on the Owner's residence, the Owner should consult local authorities or an attorney to verify requirements applicable to this Agreement.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION DATE
- 3 CONTRACT SUM
- 4 PAYMENT
- 5 INSURANCE
- 6 GENERAL PROVISIONS
- 7 OWNER
- 8 CONTRACTOR
- 9 ARCHITECT
- 10 CHANGES IN THE WORK
- 11 TIME
- 12 PAYMENTS AND COMPLETION
- 13 PROTECTION OF PERSONS AND PROPERTY
- 14 CORRECTION OF WORK
- 15 MISCELLANEOUS PROVISIONS
- 16 TERMINATION OF THE CONTRACT
- 17 OTHER TERMS AND CONDITIONS

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

- .1 this Agreement signed by the Owner and Contractor;
- .2 the drawings and specifications prepared by the Owner, dated June 20, 2018 , and enumerated as follows:

Drawings:

(Table Deleted)

Specifications:

(Table Deleted)

- .3 addenda prepared by the Owner as follows:

- .4 written orders for changes in the Work issued after execution of this Agreement; and
- .5 other documents, if any, identified as follows:

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

The number of calendar days available to the Contractor to substantially complete the Work is the Contract Time. The date of commencement of the Work shall be the date of this Agreement unless otherwise indicated below. The Contractor shall substantially complete the Work, no later than 120 calendar days from the date of commencement. *(Insert the date of commencement, if it differs from the date of this Agreement.)*

The date of commencement shall be the date of the Notice to Proceed.

ARTICLE 3 CONTRACT SUM

§ 3.1 Subject to additions and deductions in accordance with Article 10, the Contract Sum is:

(\$)

§ 3.2 For purposes of payment, the Contract Sum includes the following values related to portions of the Work: *(Itemize the Contract Sum among the major portions of the Work.)*

Portion of Work

Value

§ 3.3 Unit prices, if any, are as follows: NONE

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

Item

Units and Limitations

Price per Unit (\$0.00)

§ 3.4 Allowances included in the Contract Sum, if any, are as follows: NONE

(Identify allowance and state exclusions, if any, from the allowance price.)

Item

Price

§ 3.5 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

Allowance #1

Lump Sum General Contingency Allowance: Fifteen Thousand Dollars (\$15,000.00) for use according to Owner's written instructions associated with unforeseen conditions, cosmetic improvements, and other scope not indicated in the construction documents.

Allowance #2

Lump Sum Locker Allowance: Ten Thousand Dollars (\$10,000.00) for use according to Owner's written instructions.

Allowance #3

Lump Sum Wood Shelving Allowance: Five Thousand Dollars (\$5,000.00) for use according to Owner's written instructions.

Allowance #4

Lump Sum Sitework Allowance: Five Thousand Dollars (\$5,000.00) for use according to Owner's written instructions.

§ 3.6 The Contract Sum shall include all items and services necessary for the proper execution and completion of the Work.

ARTICLE 4 PAYMENT

§ 4.1 Based on Contractor's Applications for Payment, the Owner shall pay the Contractor, in accordance with Article 12, as follows:

(Insert below timing for payments and provisions for withholding retainage, if any.)

§ 4.2 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate below, or in the absence thereof, at the legal rate prevailing at the place of the Project.

0 %

ARTICLE 5 INSURANCE

§ 5.1 The Contractor shall provide Contractor's general liability and other insurance as follows:

(Insert specific insurance requirements and limits.)

(Table Deleted)

Unless otherwise waived by Rock Hill School District Three, at Contractor's sole expense, Contractor shall procure and maintain the following minimum insurances with insurers licensed in South Carolina and rated A-VII or better by A.M. Best.

The insurance certificate should name Rock Hill Schools and J.M. Cope Construction as additional insured. In addition, include a 30-day-in-advance insurance cancellation notice provision in the certificate.

1. Statutory Workers' compensation and Employer's Liability Insurance in an amount not less than (\$500,000).
2. Commercial General Liability insurance with limits of liability not less than one million dollars (\$1,000,000) per occurrence, Rock Hill School District Three, its officers, employees, and agents shall be named as an additional insured with respects to the General Liability Insurance policy, and such status as additional insured shall be evidenced by a written endorsement to the policy provided to owner.
3. Commercial Automobile Liability insurance for all owned, non-owned and hired vehicles with limits of liability not less than one million (\$1,000,000) combined single limit.

§ 5.2 The Owner shall provide property insurance to cover the value of the Owner's property, including any Work provided under this Agreement. The Contractor is entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its general liability insurance policy to cover the Contractor's obligations under Section 8.12.

§ 5.4 Each party shall provide certificates of insurance showing their respective coverages prior to commencement of the Work.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against each other and any of their subcontractors, suppliers, agents and employees, each of the other; for damages caused by fire or other causes of loss to the extent covered by property insurance or other insurance applicable to the Work.

ARTICLE 6 GENERAL PROVISIONS

§ 6.1 THE CONTRACT

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 THE WORK

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 INTENT

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.

§ 6.4 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

Documents prepared by the Owner are instruments for use solely with respect to this Project. The Contractor, subcontractors, sub-subcontractors, and material or equipment suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner.

ARTICLE 7 OWNER

§ 7.1 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 7.1.1 If requested by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, the Owner shall obtain and pay for other necessary approvals, easements, assessments and charges.

§ 7.2 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made.

§ 7.3 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 seven day period after receipt of written 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, correct such deficiencies. In such case, the Contract Sum shall be adjusted to deduct the cost of correction from payments due the Contractor.

§ 7.4 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

§ 7.4.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

ARTICLE 8 CONTRACTOR

§ 8.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies or omissions discovered to the Owner.

§ 8.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's information a Contractor's construction schedule for the Work.

§ 8.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 8.3.1 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.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner have made a timely and reasonable objection.

§ 8.4 LABOR AND MATERIALS

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

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

§ 8.5 WARRANTY

The Contractor warrants to the Owner that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents.

§ 8.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes that are legally required when the Contract is executed.

§ 8.7 PERMITS, FEES AND NOTICES

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. 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 full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Owner in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules and regulations.

§ 8.8 SUBMITTALS

The Contractor shall promptly review, approve in writing and submit to the Owner Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

§ 8.9 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents and the Owner.

§ 8.10 CUTTING AND PATCHING

The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

§ 8.11 CLEANING UP

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery and surplus material; and shall properly dispose of waste materials.

§ 8.12 INDEMNIFICATION

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Owner'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.

ARTICLE 9 OWNER

§ 9.1 The Owner will provide administration of the Contract as described in the Contract Documents. The Owner will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Owner will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Owner will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Owner will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Owner's observations and evaluations of the Contractor's Applications for Payment, the Owner will review and certify the amounts due the Contractor.

§ 9.5 The Owner has authority to reject Work that does not conform to the Contract Documents.

§ 9.6 The Owner will promptly review and approve or take appropriate action upon Contractor's submittals, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 9.7 The Owner will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request from either the Owner or Contractor.

§ 9.8 Interpretations and decisions of the Owner 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 Owner 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.

§ 9.9 The Owner's duties, responsibilities and limits of authority as described in the Contract Documents shall not be changed without written consent of the Owner and Contractor. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may 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 in writing. If the Owner and Contractor can not agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit.

§ 10.2 The Owner will have authority to order minor changes in the Work not involving changes in the Contract Sum or the Contract Time and not inconsistent with the intent of the Contract Documents. Such orders shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall carry out such orders promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment.

ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 CONTRACT SUM

The Contract Sum stated in the Agreement, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 12.2 APPLICATIONS FOR PAYMENT

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Owner an itemized Application for Payment for Work completed in accordance with the values stated in the Agreement. Such Application shall be supported by data substantiating the Contractor's right to payment as the Owner may reasonably require. 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 stored, and protected from damage, off the site at a location agreed upon in writing.

§ 12.2.2 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 other encumbrances adverse to the Owner's interests.

§ 12.3 CERTIFICATES FOR PAYMENT

The Owner will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Owner determines is properly due, or notify the Contractor in writing of the Owner's reasons for withholding certification in whole or in part.

§ 12.4 PROGRESS PAYMENTS

§ 12.4.1 After the Owner has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 The Owner shall not have responsibility for payments to a subcontractor or supplier.

§ 12.4.4 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 requirements of the Contract Documents.

§ 12.5 SUBSTANTIAL COMPLETION

§ 12.5.1 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 the Owner can occupy or utilize the Work for its intended use.

§ 12.5.2 When the Work or designated portion thereof is substantially complete, the Owner will make an inspection to determine whether the Work is substantially complete. When the Owner determines that the Work is substantially complete the Owner shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish the responsibilities of the Owner and Contractor, and shall 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.

§ 12.6 FINAL COMPLETION AND FINAL PAYMENT

§ 12.6.1 Upon receipt of a final Application for Payment, the Owner will inspect the Work. When the Owner finds the Work acceptable and the Contract fully performed, the Owner will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Owner releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests or encumbrances arising out of the Contract.

§ 12.6.3 Acceptance of final payment by the Contractor, a subcontractor or material 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 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury or loss to employees on the Work, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

§ 14.1 The Contractor shall promptly correct Work rejected by the Owner as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 ASSIGNMENT OF CONTRACT

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

§ 15.2 TESTS AND INSPECTIONS

§ 15.2.1 At the appropriate times, the Contractor shall arrange and bear cost of tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Owner requires additional testing, the Contractor shall perform those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections or approvals that do not become requirements until after the Contract is executed.

§ 15.3 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

ARTICLE 16 TERMINATION OF THE CONTRACT

§ 16.1 TERMINATION BY THE CONTRACTOR

If the Owner fails to certify payment as provided in Section 12.3 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 12.4.1 for a period of 30 days, the Contractor may, upon seven additional days' written notice to the Owner, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 16.2 TERMINATION BY THE OWNER FOR CAUSE

§ 16.2.1 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 for materials or labor in accordance with the respective agreements between the Contractor and the subcontractors;
- .3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or
- .4 is otherwise guilty of substantial breach of a provision of the Contract Documents.

§ 16.2.2 When any of the above reasons exist, 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' written notice, terminate employment of the Contractor and may

- .1 take possession of the site and of all materials thereon owned by the Contractor, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 16.3 TERMINATION BY THE OWNER FOR CONVENIENCE

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

1. Contractor agrees to comply with the requirements of state and federal drug free workplace requirements, District Three's tobacco-free policy, and the provision of Chapter 13, Title 8 (State Ethics Act), South Carolina Code of Laws, 1976.
2. Iran Divestment Act: (a) The Iran Divestment Act List is a list published by the Board pursuant to Section 11-57-310 that identifies persons engaged in investment activities in Iran. Currently the list is available at the following URL: <http://procurement.sc.gov/PS/PS-iran-divestment.phtm> (.) Section 11-57310 requires the government to provide a person ninety days written notice before he is included on the list. The following representation, which is required by Section 11-57-330A is a material inducement for the District to award a contract to you. (b) By signing your offer, you certify that, as of the date you sign, you are not on the then current version of the Iran Divestment Act List. (c) You must notify the Procurement Officer

immediately if, at any time before posting of a final statement of award, you are added to the Iran Divestment Act List.

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

(If required by law, insert cancellation period, disclosures or other warning statements above the signatures.)

OWNER *(Signature)*

CONTRACTOR *(Signature)*

(Printed name, title and address)

(Printed name, title and address)

LICENSE NO.:

JURISDICTION:

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

DOCUMENT 006313 - CONTRACTOR'S RFI FORM

Project: South Pointe High School Athletic
 Renovations

RFI # :

To: _____	Date: _____
_____	Contractor: _____
Attn.: _____	By: _____
Phone _____	Voice: _____
Email: _____	Email: _____

Related Section & Paragraph # : _____

Related Drawings/Details: _____

Contractor's Inquiry: _____

Contractor's Recommended Solution: _____

Attachments: _____

Response requested by: _____

Response: _____

Signed: _____ Date: _____

Attachments: _____

Distribution: _____

END OF DOCUMENT 006313

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

DOCUMENT 006325 - CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

Project: Northwestern High School Restroom

Project No.: _____

Renovations

To: _____

Specification Section #: _____

Contractor: _____

Attn.: _____

Requested by: _____

Phone: _____

Phone: _____

Email: _____

Email: _____

Reason for not providing specified item: _____

Savings to Owner for accepting substitution: _____

Specified Product/Fabrication Method

(List name/description; model no.; manufacturer): _____

Required Information for *Specified* Product:

Attached:

Point by Point Comparative Product Data

☐

Tests

☐

Reports

☐

Fabrication Drawings

☐

Samples (Where Applicable)

☐

Proposed Product/Fabrication Method

(List trade name/description; model no.;
manufacturer) : _____

Required Information for *Proposed* Product:

Attached:

Point by Point Comparative Product Data

☐ (Required)

Tests

☐

Reports

☐

Fabrication Drawings

☐

Samples (Where Applicable)

☐

List of Related Changes/Modifications: _____

Differences between proposed substitution
and specified product: _____

SOUTH POINTE HIGH SCHOOL
ATHLETIC RENOVATIONS

06/20/2018

Does proposed product/fabrication method
affects other parts of the Work?

☐

No

☐

Yes: Explain

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet th[e specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Bidder:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF DOCUMENT 006325

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Use of premises.
 - 4. Safety and security.
 - 5. Owner's occupancy requirements
 - 6. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification.
 - 1. Project: South Pointe High School Athletic Renovations
 - 2. Location: South Pointe High School, 801 Neely Road, Rock Hill, SC 29730.
 - 3. Owner: Rock Hill School District 3
 - 4. Scope of Work: The scope of work is to provide newly created space for the Baseball and Softball teams within the existing Jewell Building on the South Pointe High School campus. The existing storage space will be divided by partitions to create storage space for the teams and restrooms.

The walls will be constructed using 3-1/2-in. metal studs with 5/8-in. impact resistant gypsum wallboard on each side of the metal stud. Walls are to be run from the existing floor to the bottom of the roof deck. Provide 3-in. mineral wool sound insulation in all new walls from floor to bottom of roof deck. Seal joint of wall to roof deck with mineral wool and caulking. Cope wallboard to match roof corrugations.

Floors will remain existing concrete. Sand existing floor upon completion of work and install a concrete sealer. Install 4-in. rubber cover base on all new walls. Paint all new walls and existing metal panel walls with Sherwin Williams paint. Use acrylic latex paint. Color will be selected by the Owner.

Bathroom floors will be ceramic tile.

Install marlite/fiberglass panels to all walls in the restroom. Run material from floor to ceiling. Conceal vertical joints using manufacturer's H-channel or batten strips. Color will be white.

Install 2X2-in. moisture resistant acoustical tile in a heavy duty, painted, galvanized steel grid in the restrooms.

Furnish and install stainless steel grab bars and 24x30-in. stainless steel rimmed mirrors in the restrooms. Install owner provided paper towel, toilet paper and soap dispensers. Provide backing in walls to ensure adequate support for these fixtures.

Install 3070 HM doors and welded HM frames in the restrooms. Frame will be 16-ga. Frame can be shop welded using KD frames at contractor's choice. Door hardware shall be Schlage with privacy function. Provide ability for lock to be open from unoccupied side in emergency.

Cut concrete floor as required to install plumbing. Patch back and match existing surfaces as close as possible.

The Plumbing, HVAC, and Electrical work specifications are on the plans. Connect the plumbing and electrical to existing services as noted on the plans. Provide an occupancy sensor on the restroom lights. The vent stack will be run through the roof. Provide a water tight roof boot compatible with the existing metal roof system. Provide O&M manuals for all mechanical equipment. Provide a hinged flush metal access panel for access to the plumbing chase installed on the Baseball room side of the chase. Chase to be 24x72-in. if possible.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under single prime contract.

1.5 USE OF PREMISES

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 - c. Repair driveways, walkways and entrances damaged during construction prior to project close-out.

- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Parking: Park in designated areas only. Vehicles located in areas other than approved parking areas must be attended or they will be subject to towing.
- E. Deliveries: Provide representative to receive all materials and offload at the job site. The Owner will refuse all deliveries to other locations.
- F. Welding Operations: Comply with Owner's requirements related to Welding permits. Coordinate turning off of fire/smoke detection systems in affected areas. Contractor shall be responsible for Fire Department response fees related to construction operations.

1.6 SAFETY AND SECURITY

- A. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight and secure condition throughout construction period. Repair damage caused by construction operations.
- B. Safety and Security: Comply with Owner's requirements related to security and fire drills and alerts.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) on a limited basis during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal working hours Monday through Saturday, and other times as authorized by Owner.
- B. Smoking: No smoking is allowed.
- C. Burning: Not permitted.
- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Obtain Owner's written permission before proceeding with utility interruptions.
- E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Owner not less than two days in advance of proposed disruptive operations.
- F. Employee Identification: The Contractor will provide identification tags or shirts identifying the name of the contractor/subcontractor. Personnel are required to use identification tags or wear a shirt identifying the name of the contractor/subcontractor at all times.
- G. Employee Screening: Contractor and subcontractors certify that a "drug-free workplace" will be provided as that term is defined in Section 44-107-30 of the South Carolina Code of Laws by complying with the requirements set forth in Title 44, Chapter 107.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat 2004" numbering system.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order. Include defined costs associated with allowances in base bid.
- B. This Section includes administrative and procedural requirements governing the following:
 - 1. Lump sum allowances.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, but no later than 20 days, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.3 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices, delivery slips, or third party verified counts or measurements to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump Sum Contingency Allowance: Include a general contingency allowance of Fifteen Thousand Dollars (\$15,000.00) for use according to Owner's written instructions associated with unforeseen conditions, cosmetic improvements, and other scope not indicated in the construction documents.
- B. Allowance No. 2: Lump Sum Locker Allowance: Include an allowance of Ten Thousand Dollars (\$10,000.00) for use according to Owner's written instructions.
- C. Allowance No. 3: Lump Sum Wood Shelving Allowance: Include an allowance of Five Thousand Dollars (\$5,000.00) for use according to Owner's written instructions.
- D. Allowance No. 4: Lump Sum Sitework Allowance: Include an allowance of Five Thousand Dollars (\$5,000.00) for use according to Owner's written instructions.

END OF SECTION 012100

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. See Division 01 Section "Allowances" for procedural requirements for handling and processing allowances, if any.

1.3 MINOR CHANGES IN THE WORK

- A. Owner will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Owner's Bulletin Form.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Owner are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709.

1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, if Work includes allowances, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.
 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Owner will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Owner may issue a Construction Change Directive on Owner's Bulletin Form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule. Cost-loaded CPM Schedule may serve to satisfy requirements for the Schedule of Values.
 - 1. Submit the Schedule of Values at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 2. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Owner.
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Owner's auditing code if different from above.
 - c. Description of the Work.
 - d. Name of subcontractor.
 - e. Name of manufacturer or fabricator.
 - f. Name of supplier.
 - g. Change Orders (numbers) that affect value.
 - h. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for

- operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 9. Include a closeout valuation as a line item in the Schedule of Values for closeout activities in the Work.
 10. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 11. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: As indicated in the Agreement. The date for each progress payment is the 25th day of each month, unless otherwise specified in the Agreement. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 1 day before the date for each progress payment.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

-
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Submittals that must precede or coincide with submittal of Application for Payment at Substantial Completion include the following:
1. Operation and Maintenance Data final submittal.

- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. AIA Document G715, "Supplemental Attachment" to Accord Certificate of Insurance 255.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 10. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.4 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.
 - 1.

1.5 COORDINATION OF MECHANICAL AND ELECTRICAL WORK

- A. Coordinate location of mechanical, electrical, fire suppression and other Work shown diagrammatically on Contract Documents, including Work under other Contracts and Work by Owner. Maintain dimensions and clearances indicated on Drawings.
- B. Meet with subcontractors and Owner, as applicable to the location of the Work, to develop procedures for preparation of Coordination Drawings.
- C. If conflicts cannot be resolved, advise Owner and submit RFI or Proposal Request for changes in Contract Documents which may be required to accommodate the Work.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. The Superintendent shall represent the General Contractor at Project Meetings.
 - 2. Attendees: Inform participants and others involved, including inspectors, and individuals whose presence is required, of date and time of each meeting. Notify Owner of scheduled meeting dates and times.
 - 3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 4. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, but no later than 21 days after execution of the Agreement. Hold the conference at Project site or another convenient location.
 - 1. Attendees: Authorized representatives of Owner, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss communication and procedural issues, and the Owner's requirements on the use of the site, including the following:
 - a. Designation of key personnel and their duties.
 - b. Channels of communication.
 - c. Procedures for processing field decisions and Change Orders.
 - d. Procedures for RFIs.
 - e. Procedures for testing and inspecting.
 - f. Procedures for processing Applications for Payment.
 - g. Procedures and formats for notification of Defective Work.
 - h. Distribution of the Contract Documents.
 - i. Submittal procedures.
 - j. Preparation of Record Documents.
 - k. Use of the premises and existing building.
 - l. Work restrictions.
 - m. Owner's occupancy requirements.
 - n. Parking availability.
 - 3. Agenda: The Contractor shall discuss items of significance that could affect progress, including the following:
 - a. Designation of key personnel and their duties.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long-lead items.
 - e. Office, work, and storage areas.
 - f. Equipment deliveries and priorities.
 - g. Safety Program and First aid.

- h. Security.
 - i. Progress cleaning.
 - j. Working hours.
- C. Progress Meetings: Conduct progress meetings at weekly intervals except when noted otherwise by the Owner. Coordinate dates of meetings with preparation of payment requests. During site preparation and early stages of project, Owner may determine bi-weekly or other interval to be acceptable.
 - 1. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
 - 3. Minutes: Record the meeting minutes.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

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- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
 5. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- D. Coordination Meetings: Conduct Project coordination meetings at weekly intervals or other intervals as determined acceptable by Owner. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI to Owner in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Owner.
 - 5. RFI number, numbered sequentially.
 - 6. Specification Section number and title and related paragraphs, as appropriate.
 - 7. Drawing number and detail references, as appropriate.
 - 8. Field dimensions and conditions, as appropriate.
 - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 10. Contractor's signature.
 - 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Document 006313 provided in this Project Manual.
 - 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Action: Owner will review each RFI, determine action required, and return it. Allow seven working days for Owner's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Owner's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 - 2. Owner's action may include a request for additional information, in which case Owner's time for response will start again.

3. Owner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing within 10 days of receipt of the RFI response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Owner.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Owner's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Daily construction reports.
 - 4. Field condition reports.

1.3 DEFINITIONS

- A. General: Refer to glossary of terms in AGC's "Construction Planning & Scheduling" for terminology used in this section.
- B. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.4 SUBMITTALS

- A. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.
- B. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- C. Daily Construction Reports: Submit one copy at weekly intervals.
- D. Field Condition Reports: Submit one copy at time of discovery of differing conditions.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- C. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules. Provide a PDF copy for the Owner's use upon request.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.

4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Exposure of installed materials to water infiltration.
9. Visible signs of mold.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on sample form included in Project Manual. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
 3. END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Owner's responsive action.
- B. Informational Submittals: Written information that does not require Owner's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
 - 1. Unless otherwise indicated, schedule all submittals to Owner for initial review within 90 days of date of Notice to Proceed.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal.
 - 1. Initial Review: Allow 10 days for initial review of each submittal unless otherwise indicated. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Allow 15 days for processing each resubmittal.
 - 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Owner and to Owner's consultants, allow 15 days

for review of each submittal. Submittal will be returned to Owner before being returned to Contractor.

- D. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Owner.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Owner.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Owner observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
 - 1. Do not submit additional copies for maintenance manuals.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner will discard submittals received from sources other than Contractor.
 - 1. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 - 2. Transmittal Form: Use AIA Document G810, CSI Form 12.1A, or other form acceptable to Owner.
 - 3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "Approved," "Approved as noted," or "No exceptions taken."
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Owner in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Submit four copies of submittal for portions of work designed by consulting design professionals. Owner will return two copies. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. Do not submit product data unless specifically required.
 - 2. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 3. Mark each copy of each submittal to show which products and options are applicable.
 - 4. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Manufacturer's catalog cuts.
 - e. Wiring diagrams showing factory-installed wiring.
 - f. Printed performance curves.
 - g. Operational range diagrams.
 - h. Compliance with recognized trade association standards.
 - i. Compliance with recognized testing agency standards.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

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- D. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner will return submittal with options selected.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Submit two sets of Samples. Owner will retain one Sample sets; remainder will be returned.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Owner's sample where so indicated. Attach label on unexposed side.
 5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed. Submit samples requiring selection at same time.
 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Owner will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Delegated-Design Submittal: Comply with requirements in Division 01 Section "Quality Requirements."
- G. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures."

- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Owner will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Construction Photographs: Comply with requirements in Division 01 Section "Construction Progress Documentation."

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.


PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S ACTION

- A. General: Owner will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Owner will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

	<div style="display: flex; justify-content: space-between;"><div style="width: 80%;"><p>REVIEWED _____</p><p>REVIEWED AS NOTED _____</p><p>REVISE AND RESUBMIT _____</p><p>BY: _____</p><p>DATE: _____</p><p>REVIEWED FOR GENERAL DESIGN ONLY</p><p>DOES NOT RELIEVE VENDOR OF RESPONSIBILITY FOR COMPLIANCE WITH CONTRACT DOCUMENTS</p></div><div style="width: 15%; text-align: center;"><p>_____</p><p>_____</p><p>_____</p><p>_____</p><p>_____</p><p>_____</p><p>_____</p></div></div>
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- C. Informational Submittals: Owner will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

- E. Submittals not required by the Contract Documents will not be reviewed and may be discarded.
- F. List of specification sections requiring submittals.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-control services required by Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 3. Specification Sections throughout Project Manual for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Owner.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- F. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- G. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Owner for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision before proceeding.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 1. Specification Section number and title.
 2. Description of test and inspection.
 3. Identification of applicable standards.
 4. Identification of test and inspection methods.
 5. Number of tests and inspections required.
 6. Time schedule or time span for tests and inspections.
 7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and that is acceptable to authorities having jurisdiction.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Tests and inspections not assigned to Contractor will be furnished by Owner. Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform, within two weeks after Contract is awarded.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. For tests and inspections indicated as the Contractor's responsibility, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 5. Do not perform any duties of Contractor.

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- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
 2. Do not install finishes until required inspection of concealed construction is completed and work approved.
 - a. Coordinate in-wall and above-ceiling inspection by authorities having jurisdiction and observation by Owner.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- I. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Owner and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Owner with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Owner.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Owner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Owner's action on Contractor's submittals, applications, and requests, "approved" is limited to Owner's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Owner. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	(601) 634-2355
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil/	(215) 697-6257
	Available from General Services Administration www.apps.fss.gsa.gov/pub/fedspecs/index.cfm	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-5434

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
 - 2. Heating and cooling facilities.
 - 3. Ventilation.
 - 4. Electric power service.
 - 5. Lighting.
- C. Support facilities include, but are not limited to, the following:
 - 1. Project identification and temporary signs.
 - 2. Waste disposal facilities.
 - 3. Field offices.
 - 4. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Fire protection.

1.3 DEFINITIONS

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. Owner's construction forces.
 - 2. Occupants of Project.
 - 3. Owner.
 - 4. Testing agencies.
 - 5. Personnel of authorities having jurisdiction.
- B. Sewer Service: Provide Self-Contained Toilet Units for use of construction personnel for the duration of the project.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. General: Provide equipment suitable for use intended.

- B. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- E. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities. Use of owner facilities is not permitted.
 - 1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 - 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
 - a. Provide safety showers, eyewash fountains, and similar facilities where required by authorities having jurisdiction.
 - 3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
- B. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
 2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 01 Section "Execution Requirements" for progress cleaning requirements.
 1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
- C. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.
- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
- E. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
- B. Stormwater Control: Refer to Division 01 Section "Temporary Erosion and Sedimentation Control."

- C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
 - 3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 - 4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 - 5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
 - 1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
 - 2. Insulate partitions to provide noise protection to occupied areas.
 - 3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 - 4. Protect air-handling equipment.
 - 5. Weatherstrip openings.
- F. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 - 5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
 - 6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Individual Specification Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use form provided in this project manual.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of owner.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction, where available for type of material proposed.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Owner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Owner cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Owner will notify Contractor of approval or rejection of proposed comparable

product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
- b. Use product specified if Owner cannot make a decision on use of a comparable product request within time allocated.

- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Owner will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Owner's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies

- with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
 8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
 9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Owner's sample. Owner's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Owner will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Owner will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Requests for substitution following award of contract must comply with requirements of this article and are restricted to those necessitated by the following circumstances:
 1. Specified product is no longer available for purchase.
 2. Specified product is not available within schedule requirements of project.
 3. Specified product is not compatible with other product approved for project.
 4. Specified warranty is not available.
- B. Timing: Owner will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Owner.
- C. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied and so certified by General Contractor. If the following conditions are not satisfied, Owner will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Owner for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Owner will consider Prime Bidders' / General Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of owner, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 – EXECUTION AND CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Execution of the Work.
 - 2. Cutting and Patching.
 - 3. Contract closeout, including, but not limited to, the following:
 - 4. Inspection procedures.
 - 5. Warranties.
 - 6. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner, if so required in Division 08 Section "Door Hardware." Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner 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 Owner, 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.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner 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.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies 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. Use CSI Form 14.1A.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Owner.
 - d. Name of Contractor.
 - e. Page number.

1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

- 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 the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-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.

PART 2 - PRODUCTS

2.1 PROJECT RECORD DOCUMENTS

- A. Maintain record documents as project progresses. Final Project Record Documents shall include:
 - 1. Contract Drawings, marked to record actual construction.
 - 2. Specifications, marked to record actual construction.
 - 3. Addenda.
 - 4. Change Orders and other modifications to Contract.
 - 5. Reviewed shop drawings, product data and samples.
 - 6. Inspection certificates.
 - 7. Manufacturer's certificates.

2.2 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
- C. Field Engineering:

1. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner promptly.
 2. Provide field engineering services; establish grades, line and levels by use of recognized engineering survey practices.
 3. Control datum for survey is that established by Owner-provided survey. Locate and protect control and reference points.
- D. Installation:
1. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 2. Make vertical work plumb and make horizontal work level.
 3. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 4. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 5. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- E. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- F. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- G. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
- I. Coordination: Coordinate construction and operations of the Work with work performed by separate Contractors and Owner's construction forces.
- 3.2 CUTTING AND PATCHING
- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
- B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
- C. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
- D. Employ skilled workers to perform cutting and patching.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

- F. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3.3 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Complete final cleaning requirements, including touchup painting, and cleaning of HVAC equipment and ductwork.
 - b. 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.
 - c. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - d. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

END OF SECTION 017000

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Coordination of Owner-installed products.
 - 3. Moisture and mold control.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Owner. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on Request for Information form provided in the Project Manual.

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.5 MOISTURE AND MOLD CONTROL

- A. General: Coordinate requirements in Contractor's approved Material and Mold Control Plan as described in Division 01 Section "Product Requirements." Avoid trapping water in finished work. Document visible signs of mold that may appear during construction. Comply with recommendations contained in Associated General Contractors (AGC) document "Managing the Risk of Mold in the Construction of Buildings," including the following:
- B. Partially Enclosed Phase of Construction:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace or clean stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- C. Controlled Phase of Construction

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Utilize permanent HVAC system to control humidity.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water.
 - 1. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for forty-eight hours are considered defective.
 - 2. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Indicate materials containing moisture levels higher than allowed. Report findings in writing to Owner.
 - 3. Remove such materials that are not completely restored to their manufactured moisture level within forty-eight hours.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-suppression systems.
 - 4. Mechanical systems piping and ducts.
 - 5. Control systems.
 - 6. Communication systems.
 - 7. Electrical wiring systems.
 - 8. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 - 1. Water, moisture, or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Equipment supports.
 - 4. Piping, ductwork, vessels, and equipment.
 - 5. Noise- and vibration-control elements and systems.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Owner's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.

- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning, including cleaning of HVAC system.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner, if so required in Division 08 Section "Door Hardware." Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner 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 Owner, 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.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner 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.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies 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. Use CSI Form 14.1A.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Owner.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

- 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 the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-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.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a 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. Remove snow and ice to provide safe access to building.
 - f. 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.

- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates. Remove paint or other matter obscuring labels.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction or if inspection indicates units are not in clean, like-new condition. Refer to Final Cleaning of HVAC System below.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- 2. Supply Air System: Vacuum clean all interior surfaces and components in supply ductwork from the air handlers to all supply diffusers served by each air handler.
 - a. Vacuum clean all supply fan plenums.
 - b. Vacuum clean all coil plenums.
 - c. Wire brush and vacuum clean interior of fan housings and fan blades.
 - d. Wash supply fan bell inlets, fan blades, and fan interior surfaces using 500 to 1,000 p.s.i. moderate pressure wash with approved disinfectant.
 - e. Clean all turning vanes at both upstream and downstream sides.
 - f. Vacuum clean all interior components of all VAV mixing boxes.
 - g. Remove all supply air diffusers, vacuum, wash clean and re-install.
 - h. Vacuum and wash clean all filter holding frames and install new filters.
 - 3. Return Air System: Vacuum clean all interior surfaces and components in return air ductwork from individual return grilles to the air handlers.
 - a. Vacuum clean all fresh air intake louvers, dampers, and return air/fresh air intake plenums.
 - b. Clean all turning vanes at both upstream and downstream sides.
 - c. Remove all return air grilles and wash clean and re-install.
 - 4. Clean and disinfect all condensate trays and insure that drain lines are free-flowing.
 - 5. Dispose of all debris removed from the HVAC system.

- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit 1 draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Owner will return one copy of draft and indicate whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Owner will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Owner's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Owner's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.

3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-

- reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.

5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.

B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements.
- 2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- E. Predemolition Photographs or Video: Submit before Work begins.
- F. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
 - 1. Coordinate with owner for warranty requirements.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. 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. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Protect items after cleaning as necessary. Identify contents of containers.
 3. Store items in a secure area on site until delivery to Owner.
 4. Transport items to Owner's storage area on site.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

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 specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each type of manufactured material and product, including forming and reinforcement accessories, admixtures, waterstops, joint systems, joint fillers, curing compounds, and others if requested.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar to that indicated for this Project with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each type of admixture from the same manufacturer.
- D. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 318, "Building Code Requirements for Structural Concrete."
 - 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material.
- B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, unless otherwise indicated.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. Precast concrete supports or concrete bricks may be used only for concrete members cast on earth. Reinforcement shall be wire-tied to these type supports periodically to prevent it from becoming dislodged during concrete placement.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 36. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Fly Ash: ASTM C 618, Class C or F.
- C. Normal Weight Aggregate: ASTM C 33.
- D. Lightweight Aggregate: ASTM C 330.
- E. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.

- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. Retarding Admixture: ASTM C 494, Type B.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- F. High-Range Water-Reducing Admixture: ASTM C 494, Type F.
- G. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
- H. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.6 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.7 CURING MATERIALS

- A. Contractor shall verify that curing and sealing materials applied to floor slabs are compatible with all floor stains, coatings, tile, and other finish materials.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry. (Burleen non-staining mats).
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Acceptable products include, but are not limited to:
 - 1. 1100-CLEAR, W.R. Meadows, Inc.
 - 2. W.B. Resin Cure, Conspec Marketing & Manufacturing Co., Inc.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 RELATED MATERIALS

- A. Expansion and Isolation Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Thickness 1/2 inch unless otherwise indicated. Acceptable products include, but are not limited to:
 - 1. Fibre Expansion Joint, W.R. Meadows, Inc.

- B. Plastic Vapor Barrier: ASTM E 1745, Class A. Woven materials are not acceptable. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Fortifiber Corporation; Moistop Ultra 15.
 - b. Raven Industries, Inc.; VaporBlock 15.
 - c. Stego Industries, LLC; Stego Wrap, 15 mils.
 - d. Reef Industries; Griffolyn 15 Mil Green.
- C. Slab Granular Base Course: Clean crushed stone, or crushed gravel, material shall be compactable. Rough or sharp materials which may puncture the vapor retarder shall be covered with a 1/2" layer of fine-graded material rolled or compacted over the base course prior to installation of the vapor barrier.
- D. Dovetail Anchor Slots: Hot-dipped galvanized sheet steel, not less than 0.0336 inch thick with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- E. Latex Bonding Agent: ASTM C 1059, Type I or II, non-redispersible, acrylic emulsion or styrene butadiene.
- F. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- G. Epoxy Anchoring Adhesive: ASTM C 881, two-component epoxy resin, supplied in manufacturer's standard side-by-side cartridge and dispensed through a mixing nozzle supplied by the manufacturer, of class and grade to suit requirements.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.10 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 1. Proportion normal weight structural concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
- D. Maximum Slump:
 1. Concrete containing high-range water-reducing admixture or plasticizing admixture: 8 inches, after admixture is added to concrete with verified slump of 2 to 4 inches.
 2. Other concrete: 4 inches, plus or minus one inch.
- E. 28-Day Compressive Strength: 3,000 PSI
- F. Air Content: In exterior concrete which is exposed to weather, add air-entraining admixture to result in concrete at point of placement having an air content of 6 percent within a tolerance of plus or minus 1.5 percent. Footings and other subterranean concrete do not require air-entrainment.
- G. Do not air entrain concrete in trowel-finished interior floors and suspended slabs except where air entrainment is required to achieve specified unit weights for lightweight concrete. Do not allow entrapped air content in non-air-entrained concrete to exceed 3 percent.
- H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

- J. Concrete Mix for Polished Concrete Areas: Concrete mix for slabs on grade which are scheduled to receive polished concrete shall comply with the following requirements:

1. Maximum water-cement ratio shall not exceed 0.45.
2. No air entrainment is permitted.
3. No fly ash is permitted.
4. 28-day compression strength shall be 4000 psi.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, fabricate reinforcing so that lap splices in alternate bars are staggered.

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Job site mixing is not permitted.
- C. Fiber Reinforcement: In concrete where fiber reinforcement is indicated, uniformly disperse synthetic fibers in concrete mixture.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class D, 1 inch for rough-formed finished surfaces which will be permanently concealed from view.
- D. Construct forms tight enough to prevent loss or leakage of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1 vertical to 1.5 horizontal.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, water, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
- B. Conduits, Pipes, and Sleeves: Conduits are not permitted in elevated slabs or slabs on grade. Conduits, pipes and sleeves shall be permitted to be embedded in other concrete elements only with approval of the Structural Engineer. Embedded items must meet the following requirements:
 - 1. Conduits, pipes and sleeves shall be made only of materials not harmful to concrete. Aluminum is not permitted.
 - 2. Diameter of items shall not be larger than 1/3 the thickness of the wall, footing, or beam in which they are embedded.
 - 3. Items shall not be spaced closer than 3 diameters on center.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. Retaining walls and basement walls may not be backfilled until after 7 days minimum and after the concrete has achieved 75 percent of 28-day design compressive strength as verified by compression test results.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, install reinforcing so that lap splices in alternate bars are staggered.
- D. Before concrete is placed, accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. "Wet-sticking" of dowels, anchor bolts and reinforcing is not permitted. **Do not weld or tack weld reinforcing bars** unless indicated on the drawings or authorized by the Structural Engineer.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets so that length of overlap measured between outermost cross wires of each fabric sheet is not less than one spacing of cross wires plus 2 inches. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- G. Where blockouts are formed in slabs, unless otherwise indicated provide two #4 diagonal bars, 4'-0" long, at each corner of the blockout in the middle of the depth of the slab.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Provide construction joints at all locations where concrete placement is terminated resulting in concrete elements not being completed in a single monolithic placement. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Provide keys at construction joints using preformed galvanized steel or wood bulkhead forms, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Locate joints in continuous wall footings as required to facilitate construction.
 - 6. In areas with terrazzo or hard tile, coordinate joint locations to match joints in terrazzo or tile.
- C. Contraction (Control) Joints in Slabs on Grade: Construct contraction joints in slabs on grade to form patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab thickness unless otherwise indicated.
 - 1. Contraction joints shall be cut as soon as possible after slab finishing as may safely be done without dislodging aggregate or raveling joint edges. Joints shall be cut within 12 hours after concrete is placed.
 - 2. If joint pattern is not shown, provide contraction joints at a maximum spacing of 15 feet in each direction. Locate to conform to bay spacing where possible (at column centerlines, half bays, third bays.)
 - 3. In areas with terrazzo or hard tile, coordinate joint locations to match joints shown in terrazzo or tile.
 - 4. Use dowel sleeves or lubricate one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless water has been withheld from the mix for this purpose.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When the average daily outdoor temperature is expected to fall below 40 deg F for three successive days, or when freezing temperatures may occur during the first 24 hours after concrete placement, deliver and maintain concrete temperature within the temperature range required by ACI 306.1. The average daily outdoor temperature is the average of the highest and lowest temperature during the period from midnight to midnight.
 2. Uniformly heat water and/or aggregates before mixing to obtain a concrete mixture temperature at point of placement within the temperature range required by ACI 306.1.
 3. Temperatures specified to be maintained shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air.
 4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 5. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
 6. **Do not use calcium chloride.**
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature,

- provided water equivalent of ice is included in calculation of total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- H. The concrete for elevated slabs shall be placed in sequence from the lowest elevated floor to the highest elevated floor. Do not place concrete on an upper floor until the concrete on all elevated floors below has been placed.
- I. Blockouts in concrete walls to allow for erection of steel columns and beams shall be filled with concrete after the steel is erected and plumbed.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: All slabs shall first receive a float finish. Machine floating shall not be used until the concrete surface will support a finisher on foot without more than a 1/4 inch indentation.
- C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, wood flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, stain, or another thin film-finish coating system.
 - 2. Slabs on grade which are scheduled to receive polished concrete shall receive a hard steel trowel finish (3 passes).
 - 3. On lightweight concrete slabs containing entrained air, machine floating shall be started as late as possible and hard and prolonged troweling shall be avoided.
 - 4. Finish surfaces to the following tolerances, according to ASTM E 1155:
 - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where terrazzo, ceramic or quarry tile is to be installed by thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes, beam pockets, column pockets, and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and trowel-finish concrete surfaces. At stair landings, provide plain-steel welded wire fabric, of the same size used in adjacent floor slabs, located at mid-depth of the concrete fill.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss exceeding 0.1 pounds per square foot per hour, based on chart in ACI 305R, before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped

at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period of seven days.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period of seven days.
- F. Remove curing and sealing materials from floor slabs, without damaging concrete surfaces, by method recommended by curing and sealing manufacturer after the curing period in areas where floor stains, coatings, tile, and other floor finish materials are to be applied if recommended by the floor finish manufacturer.

3.11 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than seven days old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler where indicated according to ACI 302 and manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least 60 days. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Do not use backer rod in saw-cut joints. Formed joints may be filled with silica sand to

within 2 inches of the slab surface or a backer rod can be placed in compression at a depth of 2 inches below the slab surface.

- D. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 BONDING NEW CONCRETE TO EXISTING CONCRETE

- A. At locations where new concrete is placed adjacent to existing concrete, unless indicated otherwise, clean and roughen the face of the existing concrete and provide a bonding agent in accordance with the manufacturer's recommendations.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Concrete which will be exposed to view in the finished structure shall be restored to its original intended appearance or shall be removed and replaced. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension, down to solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at an inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness by using a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., plus one set for each additional 50 cu. yd. more than the first 25 cu. yd.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for a given concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 90 deg F and above.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days two at 28 days, and hold one specimen in reserve for later testing if necessary.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project name, date of concrete placement and testing, location of concrete batch in Work, mix identification including design compressive strength at 28 days, slump, compressive breaking strength, and type of break for both 7-and 28-day tests. Air content and concrete temperature results shall also be provided when applicable.
- E. Special inspector shall monitor the installation of post-installed concrete anchors and reinforcing. Before installation of each type anchor or reinforcing begins, the inspector shall verify that the contractor's proposed installation procedure conforms with the manufacturer's printed installation instructions (MPII). The inspector shall monitor the initial installation of each type of anchor or reinforcing to verify conformance with the (MPII) and shall monitor periodically thereafter.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive devices will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Special inspector shall make additional tests of concrete at Contractor's expense when test results indicate that slump, air entrainment, compressive strength, or other requirements have not been met, as directed by Architect. Special inspector may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall fill core-drilled holes with non-shrink grout unless directed otherwise by Architect.

END OF SECTION 03 30 00

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with timber.
 - 3. Framing with engineered wood products.
 - 4. Wood blocking and nailers.
 - 5. Wood sleepers.
- B. Related Sections include the following:
 - 1. Division 6 Section "Wood Sheathing."
 - 2. Division 6 Section "Metal-Plate-Connected Wood Trusses."

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.
 - 6. Roof construction.
 - 7. Plywood backing panels.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Non-Load-Bearing Interior Partitions: No. 2 of any species.
- C. All Framing Other Than Interior Non-Load-Bearing Walls: No. 2 grade of the following species:
 - 1. Southern pine; SPIB.

2.4 TIMBER FRAMING

- A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
 - 1. Species and Grade: Southern pine, No. 1 grade; SPIB.
 - 2. Maximum Moisture Content: 20 percent.

2.5 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boise Cascade Corporation.
 - b. Finnforest USA.
 - c. Georgia-Pacific.
 - d. Louisiana-Pacific Corporation.
 - e. Pacific Woodtech Corporation.
 - f. Roseburg Forest Products Co.
 - g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
 - h. Weyerhaeuser Company.
 2. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal- depth members.
 3. Modulus of Elasticity, Edgewise: 1,900,000 psi.
 4. Structural Properties: Provide units with depths indicated and structural properties and capacities at least as great as the Weyerhaeuser products specified on the structural drawings.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Cants.
- B. For items of dimension lumber size, provide Construction or No. 2, Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, fire retardant treated, or in area of high relative humidity, provide fasteners, including bolts and anchor bolts, with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Exterior joints in horizontal traffic surfaces.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 4. Interior joints in horizontal traffic surfaces.
- B. Related Sections include the following:
 - 1. Division 07 Section "Sheet Metal Flashing and Trim for Roofing" for sealant related to roofing system.
 - 2. Division 08 Section "Glazed Aluminum Curtain Walls" for curtainwall sealants.
 - 3. Division 08 Section "Glazing" for glazing sealants.
 - 4. Division 09 Section "Acoustical Panel Ceilings" for acoustical sealant for exposed and concealed joints in acoustical panel ceilings.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Compatibility and adhesion test reports.
- D. Product certificates.

1.4 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

- B. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion for exterior elastomeric sealants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 Articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of available colors including premium colors.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Single Component Nonsag Neutral-Curing Silicone Sealant ES-1:

1. Products:
 - a. Dow Corning Corporation; 756S H.P.
 - b. Pecora Corporation; 890.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 100.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 6. Non-staining for natural stone substrates.
 7. Field-tintable to match adjacent substrates.
- E. Single-Component Neutral-Curing Silicone Sealant ES-2:
1. Products:
 - a. Dow Corning Corporation; 790.
 - b. Pecora Corporation; 864.
 - c. Tremco; Spectrem 2.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 50.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 6. Custom color to match adjacent substrates.
- F. Single-Component Traffic Exposure Neutral-Curing Silicone Sealant ES-3:
1. Products:
 - a. Dow Corning Corporation; 890-SL.
 - b. Dow Corning Corporation; 890 (Gun grade).
 - c. Dow Corning Corporation; 890-SL.
 - d. Pecora Corporation; 300 Pavement Sealant (Self Leveling).
 - e. Pecora Corporation; 301 Pavement Sealant (Gun grade).
 2. Type and Grade: S (single component) and P (pourable).
 3. Class: 100/50.
 4. Uses Related to Exposure: NT and T (traffic).
 5. Uses Related to Joint Substrates: M A and O, as applicable to joint substrates indicated.
- G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-4:
1. Products:
 - a. Dow Corning Corporation; 999.
 - b. Pecora Corporation; 898.
 - c. Tremco; Tremsil 600 White.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- H. Single-Component Nonsag Urethane Sealant ES-5:
1. Products:
 - a. Pecora Corporation; Dynatrol I-XL.
 - b. Sika Corporation, Inc.; Sikaflex 15LMg
 - c. Tremco; DyMonic.

- d. Tremco; Vulkem 921.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Paintable.

I. Multicomponent Pourable Urethane Sealant ES-6:

1. Products:
 - a. Bostik Findley; Chem-Calk 550. (35)
 - b. Pacific Polymers, Inc.; Elasto-Thane 227 High Shore Type I (Self Leveling).
 - c. Pacific Polymers, Inc.; Elasto-Thane 227 Type I (Self Leveling).
 - d. Pecora Corporation; Urexpam NR-200. (20-25)(20g/L)
 - e. Tremco; THC-901. (30-35)(60 G/L)
 - f. Tremco; THC-900. (30-35) (60 G/L) ramps
 - g. Tremco; Vulkem 245 (200 g/L)
 - h. Pecora Corporation; Dynatread (40) (104 g/L)
 - i. Pecora Corporation; Dynatrol II-SG. (25-35) (25 g/L)
 - j. Sika Corporation, Inc.; Sikaflex - 2c SL. (40)
 - k. Sonneborn, Division of ChemRex Inc.; SL 2. (30-35) (65 g/l)
2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: ceramic tile.

2.4 EPOXY RESIN JOINT SEALANTS

- A. Epoxy Resin Sealant ERS-1: Comply with ASTM C 881, Type III, Grade 3, Class B and C.
- B. Products: Pick-Proof two-component, solvent-free, moisture insensitive, low modulus, non-sagging epoxy resin gel
 1. Degussa Corporation; Concrecive Lliquid LPL
 2. Sika Corporation; Sikadur 23, Lo-Mod Gel
 3. Tamms Industries; Duralcrete Gel

2.5 LATEX JOINT SEALANTS

- A. Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.
- B. Products:
 1. Pecora Corporation; AC-20+.
 2. Sonneborn, Division of ChemRex Inc.; Sonolac.
 3. Tremco; Tremflex 834.

2.6 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints AS-1: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces

airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

- B. Acoustical Sealant for Concealed Joints AS-2: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), or B (bicellular material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. For curtain wall applications, Type O (open-cell material) may be considered; consult the sealant manufacturer to confirm the specific backer material to be used for the specific project and application, and submit to Architect the manufacturer's written recommendations.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
 - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 2. Remove laitance and form-release agents from concrete.
 - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type recommended by manufacturer to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 EXTERIOR JOINT-SEALANT SCHEDULE

- A. Cast-in-place concrete, vertical construction joints:
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- B. Cast-in-place concrete slabs, horizontal nontraffic and traffic isolation and contraction joints:
 - 1. ES-3 Single-component pourable neutral-curing silicone sealant.
- C. Unit masonry, vertical control and expansion joints:
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- D. Metal panels, butt joints:
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- E. Exterior vertical joints between different materials listed above:
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- F. Exterior perimeter joints between materials listed above and frames of doors windows and louvers.
 - 1. ES-2 Single-component neutral-curing silicone sealant.
- G. Exterior control and expansion joints in ceilings and other overhead surfaces.

- 1. ES-2 Single-component neutral-curing silicone sealant.
 - H. Exterior control and expansion joints in horizontal traffic surfaces of unit pavers:
 - 1. ES-3 Single-component pourable neutral-curing silicone sealant.
 - I. Other vertical or horizontal non-traffic joints:
 - 1. ES-2 Single-component neutral-curing silicone sealant.
 - J. Other exterior horizontal traffic joints:
 - 1. ES-3 Single-component pourable neutral-curing silicone sealant.
- 3.4 INTERIOR JOINT SEALANT SCHEDULE
- A. Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. ES-2 Single-component neutral-curing silicone sealant.
 - B. Vertical joints on exposed surfaces of interior unit masonry walls and partitions:
 - 1. ERS-1: Epoxy resin gel sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
 - C. Interior perimeter joints of exterior openings.
 - 1. ES-2 Single-component neutral-curing silicone sealant.
 - D. Interior ceramic expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
 - 1. ES-6 Multi-component pourable polyurethane sealant.
 - E. Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. ES-4 Single-component mildew-resistant neutral -curing silicone sealant.
 - F. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - 1. LS-1 Latex sealant.
 - 2. Joint-Sealant Color: Paintable white.
 - G. Other non-dynamic interior joints including between interior wall surfaces and casework.
 - 1. LS-1 Latex sealant.
 - 2. Joint-Sealant Color: Clear.
 - H. Acoustical interior joints for exposed joints.
 - 1. AS-1 Latex sealant.
 - I. Acoustical interior joints for concealed joints.
 - 1. AS-2 Latex sealant.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Standard hollow metal doors and frames.
- B. Related Sections:
 - 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 08 Section "Louvers" for exterior louvers.
 - 3. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
 - 4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
 - 5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. 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 each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Other Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. 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 as close to neutral pressure as possible according to NFPA 252.
- C. 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 or UL 9. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

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 nonvented plastic.
 1. Provide additional protection to prevent damage to finish of factory-finished units.
- 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.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld Building Products, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Curries Company; an Assa Abloy Group company.
 4. D & D Specialties, Inc., Union, SC.
 5. Deansteel Manufacturing Company, Inc.
 6. Fleming Door Products Ltd.; an Assa Abloy Group company.
 7. Habersham Metal Products Company.
 8. Mesker Door Inc.
 9. Pioneer Industries, Inc.
 10. Steelcraft; an Allegion company.
 11. Republic Doors and Frames.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."

- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 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.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors.
 - 3. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. 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. Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. 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. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 4 Steel Doors: 0.067-inch- thick steel sheet.

- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
 - 4. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
 - 5. Frames for Wood Doors: 0.053-inch-thick steel sheet.
 - 6. Frames for Borrowed Lights Same as adjacent door frame.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 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, 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, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 LOUVERS

- A. Provide louvers for doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.0239-inch- thick, cold-rolled steel sheet set into 0.0359-inch- thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.10 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
 - 3. Astragals: Provide overlapping astragal 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.
- D. Hollow Metal Frames: 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.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. 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.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 6. 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 o.c. 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.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated 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 nontemplated, 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 door undercut with specified threshold to meet accessibility requirements and provide positive seal to the threshold.
 5. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.11 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 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; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. 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 squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

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.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- 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. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

- 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

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 Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections:
 - 1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction 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 factory-finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 12 by 12 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.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

- 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.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 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 temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.7 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 face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Graham; an Assa Abloy Group company.
 - 4. Lambton Doors.
 - 5. Marshfield Door Systems, Inc.
 - 6. Mohawk Flush Doors, Inc.; a Masonite company.
 - 7. Oshkosh Architectural Door Company.
 - 8. VT Industries, Ltd.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. 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: Noncombustible 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 follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch midrail blocking, in doors indicated to have exit devices.
 - 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.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Custom (Grade A faces).
 - 2. Species: Select Natural Birch.
 - 3. Cut: Plain sliced, quartered.
 - 4. Match between Veneer Leaves: Book match.
 - 5. Assembly of Veneer Leaves on Door Faces: Running match.
 - 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - 7. 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.
 - 8. Exposed Vertical Edges: Same species as faces.
 - 9. Core: Particleboard, unless otherwise indicated.
 - 10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
 - 1. Wood Species: Species compatible with door faces.

2. Profile: Manufacturer's standard shape.
 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 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. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.6 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. 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. Finish top of doors in multi-story spaces. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises, unless noted otherwise.
- C. Finish doors at factory.
- D. Transparent Finish:
1. Grade: Custom.
 2. Finish: AWI catalyzed polyurethane system.
 3. Stain, Effect and Sheen: Match Architects sample.

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 08 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: Rehang 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 081416

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 01 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.
- 3. Electrified door hardware.
- 4. Special Requirements:
 - a. **Hardware Installation:** The General Contractor shall not install door hardware. **The Door Hardware Distributor/Supplier shall be responsible for the proper installation of the door hardware supplied to this project.** If supplier has staff trained and performing installations (service available) the supplier shall install the hardware with its own forces. If the door hardware supplier does not have installation capabilities then the door hardware supplier shall contract with an experienced hardware installation firm to install door hardware for this project. The hardware supplier shall be financially responsible for damages and correction costs involved with improperly installed door hardware.
 - 1) Experience requirements for the Door Hardware Installer: 3 years of door hardware installation and completion of 2 projects of similar size, scope and complexity within the past year.

- B. Related Sections include the following:

- 1. Division 08 Section "Hollow Metal Doors and Frames" for astragals provided as part of fire-rated labeled assemblies.
- 2. Division 08 Section "Flush Wood Doors" for astragals and integral intumescent seals provided as part of fire-rated labeled assemblies.
- 3. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
- 4. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.
- 5. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
- 6. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

- 1. Hardware specified for other Sections.
- 2. Permanent cores to be installed by Owner.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 - 2. Detail interface between electrified door hardware and fire alarm, access control, security, and building control system.
 - 3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.
 - 1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Qualification Data: For Installer.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- F. Warranty: Special warranty specified in this Section.
- G. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant and sealed by the consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets 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." Double space entries, and number and date each page.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - 3. Content - Include the following information:
 - a. Identification number, location, hand, fire rating, and material of each door and frame.
 - b. Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - c. Complete designations of every item required for each door or opening including name and manufacturer.
 - d. Fastenings and other pertinent information.

- e. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - f. Explanation of abbreviations, symbols, and codes contained in schedule.
 - g. Mounting locations for door hardware.
 - h. Door and frame sizes and materials.
 - i. Retain subparagraph below for electrified door hardware.
 - j. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
4. Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
5. List of related door devices specified in other Sections for each door and frame.
- a. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
- H. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
- 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and is currently a DHI seal member, and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: 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. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Means of Egress Doors (NFPA 101):
 1. Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
 2. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1, including but not limited to the following:
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high (NFPA 101).
 4. Adjust door closer sweep periods as indicated in Part 3 of this Section.
- H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Address for delivery of keys.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies fire alarm system and detection devices access control system security system building control system.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion, except as follows:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Two years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Two Hinges: For doors with heights up to 60 inches.
 - 2. Three Hinges: For doors with heights 61 to 90 inches.
 - 3. Four Hinges: For doors with heights 91 to 120 inches.
 - 4. 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.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Size: Provide 4 ½" tall hinges for doors up to 36" in width. Doors from 37" in width to 48" in width are to receive 5" tall hinges.
- D. Hinge Weight: Unless otherwise indicated, provide the following:
 - 1. Entrance Doors: Heavy-weight or continuous hinges.
 - 2. Doors with or without Closers: Antifriction-bearing hinges.
 - 3. Interior Doors: Standard-weight hinges.
- E. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 2. Interior Hinges: Steel, with steel pin.
 - 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- F. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
 - 2. Corners: Square.
- G. Deleted

H. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors. Finish screw heads to match surface of hinges.

2.3 HINGES

A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

C. Manufacturers:

1. Baldwin Hardware Corporation (BH).
2. Bommer Industries, Inc. (BI).
3. Hager Companies (HAG).
4. IVES Hardware; an Allegion Company (IVS).
5. McKinney Products Company; an ASSA ABLOY Group company (MCK).
6. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

D. Hinges: Substitutions for hinges are limited to the following:

Material	Bearing	Hager	McKinney	Stanley	Ives	Lawrence
Steel	Plain	1279	T2714	F179	5PB1	B4181
Steel	2BB	BB1279	TA2714	FBB179	5BB1	BB4101
Steel	4BB	BB1168	T4B3786	FBB168	5BB1HW	BB5151
Stainless	Plain	1191	T2314	F191	5PB1-630	4181-32D
Stainless	2BB	BB1191	TA2314	FBB191	5PB1-630	BB4101-32D
Stainless	4BB	BB1199	T4B3386	FBB199	5BB1HW-630	BB5151-32D
Steel	Pocket Pivot	Rixson – 519	McKinney – PH4	N/A	Ives 91105F	N/A

2.4 PIVOTS AND PIVOT HINGES

- A. Pivots: BHMA A156.4. Listed under Category C in BHMA's "Certified Product Directory."
- B. Manufacturers:
 - 1. Glynn-Johnson; an Allegion Company(GJ).
 - 2. Hager Companies (HAG).
 - 3. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 4. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - 5. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.5 CONTINUOUS HINGES

- A. Manufacturers:
 - 1. IVES Hardware; an Allegion Company(IVS).
 - 2. Markar Architectural Products, Inc.; a Subsidiary of Adams Rite Manufacturing Co. (MP).
 - 3. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 4. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- B. Standard: BHMA A156.26, Grade 1-300.
 - 1. Listed under Category N in BHMA's "Certified Product Directory."
- C. General: Minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- D. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge.
 - 1. Base Metal for Exterior Hinges: Stainless steel.
 - 2. Base Metal for Interior Hinges: Stainless steel.
 - 3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel.

2.6 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Electrified Locking Devices: BHMA A156.25.
- D. Lock Trim:
 - 1. Levers: As indicated.

2. Escutcheons (Roses): Wrought.
 3. Dummy Trim: Lustra by Corbin Russwin (LWA).
 4. Lockset Designs: ML-2000 Series by Corbin Russwin. Basis of Design
- E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 2. Deadbolts: Minimum 1-inch bolt throw.
- F. Backset: 2-3/4 inches, unless otherwise indicated.
- G. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.5.

2.7 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
1. Mortise Locks: BHMA A156.13.
- B. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1; Series 1000. Listed under Category F in BHMA's "Certified Product Directory."
1. Manufacturers:
 - a. Best Access Systems; Div. of The Stanley Works (BAS).
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - d. Schlage Commercial Lock Division; an Allegion Company (SCH).

2.8 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Half-Round Surface Bolts: Minimum 7/8-inch throw.
 2. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.
 3. Mortise Flush Bolts: Minimum 3/4-inch throw.
- B. Dustproof Strikes: BHMA A156.16, Grade 1.
- C. Flush Bolts: BHMA A156.16, Grade 1.
1. Flush Bolt: Minimum of 1/2-inch- diameter rods of brass, bronze, or stainless steel with minimum 12-inch- long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.
 2. Manufacturers:
 - a. Glynn-Johnson; an Allegion Company (GJ).
 - b. Hager Companies (HAG).

- c. Rockwood Manufacturing Company (RM).
 - d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - e. Trimco (TBM).
- D. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1; designed for mortising into door edge.
 - 1. Manufacturers:
 - a. Glynn-Johnson; an Allegion Company (GJ).
 - b. Hager Companies (HAG).
 - c. IVES Hardware; an Allegion Company (IVS).
 - d. Rockwood Manufacturing Company (RM).
 - e. Trimco (TBM).

2.9 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1. Listed under Category G in BHMA's "Certified Product Directory."
- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Removable Mullions (Keyed Type): BHMA A156.3.
- G. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- H. Outside Trim: Refer to Door Hardware Schedule; material and finish to match locksets, unless otherwise indicated.
 - 1. Match design for locksets and latchsets, unless otherwise indicated.
- I. Manufacturers:
 - 1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).

2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
3. Von Duprin; an Allegion Company (VD).

2.10 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 1. Match and extend the owner's existing key system.
 2. Number of Pins: Six or Seven.
 3. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 4. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
- C. Construction Keying: Comply with the following:
 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Manufacturer: Same manufacturer as for locks and latches.
- E. Manufacturers:
 1. Best Access Systems; Div. of The Stanley Works (BAS).
 2. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 3. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 4. Schlage Commercial Lock Division; an Allegion Company (SCH).

2.11 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
- B. Keys: Nickel silver.
 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE." Information to be furnished by Owner at key conference.
 2. Quantity:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.
 3. Provide Owner with final Bittings.

2.12 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-

gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
- B. Cross-Index System: Single-index system for recording key information. Include three receipt forms for each key-holding hook. Set up by key control manufacturer.
 1. Manufacturers:
 - a. Key Control Systems, Inc. (KCS).
 - b. Lund Equipment Co., Inc. (LUN).
 - c. MMF Industries (MMF).
 - d. Sunroc Corporation (SUN).

2.13 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Manufacturers:
 1. Forms + Surfaces (FS).
 2. Hager Companies (HAG).
 3. Hiawatha, Inc. (HIA).
 4. Rockwood Manufacturing Company (RM).
 5. Trimco (TBM).

2.14 ACCESSORIES FOR PAIRS OF DOORS

- A. Carry-Open Bars: Provide carry-open bars for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
 1. Material: Polished brass or bronze, with strike plate.
- B. Coordinators: BHMA A156.3.

2.15 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide multi-sized, non-handed closers, adjustable to meet field conditions and requirements for opening force.
- C. Surface Closers: BHMA A156.4, Grade 1. Listed under Category C in BHMA's "Certified Product Directory." Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
 1. Manufacturers:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR). DC-6000 Series
 - b. LCN Closers; an Allegion Company(LCN). 4040XP Series
 - c. Norton Door Controls; an ASSA ABLOY Group company (NDC). 7500 Series

2.16 PROTECTIVE TRIM UNITS

- A. Size: 2 inches less than door width on push side and 1 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and all sides; fabricated from the following material:
 1. Material: 0.050-inch-thick stainless steel.
 2. Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Burns Manufacturing Incorporated (BM).
 - c. Don-Jo Mfg., Inc. (DJO).
 - d. Hager Companies (HAG).
 - e. Hiawatha, Inc. (HIA).
 - f. IVES Hardware; an Allegion Company(IVS).
 - g. Rockwood Manufacturing Company (RM).
 - h. Trimco (TBM).

2.17 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Mechanical Door Holders: BHMA A156.16, Grade 1.
- C. Combination Overhead Stops and Holders: BHMA A156.8, Grade 1.

- D. Electromagnetic Door Holders: BHMA A156.15. Listed under Category C in BHMA's "Certified Product Directory."
 - 1. Coordinate with fire detectors and interface with fire alarm system for labeled fire door assemblies.
- E. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.
- F. Manufacturers:
 - 1. Architectural Builders Hardware Mfg., Inc. (ABH).
 - 2. Door Controls International (DCI).
 - 3. Glynn-Johnson; an Allegion Company(GJ).
 - 4. Hager Companies (HAG).
 - 5. IVES Hardware; an Allegion Company(IVS).
 - 6. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - 7. Rockwood Manufacturing Company (RM).
 - 8. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - 9. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - 10. Trimco (TBM).

2.18 DOOR GASKETING

- A. Standard: BHMA A156.22. Listed under Category J in BHMA's "Certified Product Directory."
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. 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 gasketing on 20-minute-rated doors and on smoke-labeled doors.
- E. 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. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

G. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

H. Manufacturers:

1. Hager Companies (HAG).
2. National Guard Products (NGP).
3. Pemko Manufacturing Co. (PEM).
4. Reese Enterprises (RE).
5. Sealeze; a unit of Jason Incorporated (SEL).

2.19 THRESHOLDS

A. Standard: BHMA A156.21. Listed under Category J in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.

D. Exterior Door Thresholds: Provide gasketed threshold for all exterior doors.

E. Manufacturers:

1. Hager Companies (HAG).
2. National Guard Products (NGP).
3. Pemko Manufacturing Co. (PEM).
4. Reese Enterprises (RE).
5. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
6. Sealeze; a unit of Jason Incorporated (SEL).

2.20 MISCELLANEOUS DOOR HARDWARE

A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.

B. Auxiliary Hardware: BHMA A156.16, Grade 1.

1. Manufacturers:

- a. Baldwin Hardware Corporation (BH).
- b. Don-Jo Mfg., Inc. (DJO).
- c. Hager Companies (HAG).
- d. Lawrence Brothers, Inc. (LB).
- e. Rockwood Manufacturing Company (RM).
- f. Schlage Electronics (SCE). (power supplies)
- g. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- h. Trimco (TBM).

2.21 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum and fasteners manufactured in China are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. No self drill/tap fasteners
 - 2. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 3. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 - 4. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 - 5. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 6. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.22 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings and as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Exit devices to be mounted at 38"-42" centerline of strike from bottom of frame. Refer to the manufacturer's device template.
- B. Install each door hardware item to comply with manufacturer's 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 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
 - 1. Configuration: Provide one power supply for each door opening.

2. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- F. Key Lock Boxes: Coordinate with AHJ for quantity, locations and mounting heights.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner may engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

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.
 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE

Hinge	TA2714	US26D	MK
1 Privacy Set	ND40S RHO	626	SC
1 Door Closer	4040XP REG	AL	LC
1 Kick Plate	K1050 8" CSK 3BE	US32D	RO
1 Door Stop	409/441CU	32D/26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

MANUFACTURERS ABBREVIATIONS:

1. MK - McKinney
2. PE - Pemko
3. VD - Von Duprin
4. SC - Schlage
5. HS - HES
6. LC - LCN Closers
7. RO - Rockwood
8. OT - OTHER
9. SU - Securitron
10. SH - Schlage Electronic Security

END OF SECTION 087100

SECTION 089000 - LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Fixed, extruded-aluminum louvers.
- B. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for louvers in hollow metal doors.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: As indicated on Structural Drawings.
- B. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. Design earthquake spectral response acceleration, short period (Sds) for Project is indicated on Structural Drawings.
 - 2. Component Importance Factor is 1.0.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
 - 1. Airolite Company, LLC (The).
 - 2. Benchmark Fabricating
 - 3. Reliable Products, Inc.
 - 4. United Enertech Corp.
 - 5. American Warming and Ventilating.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
 - 2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where width of panel requires additional vertical support, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

- G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver:
 - 1. Basis-of-Design Product: Airolite K6776.
 - 2. Louver Depth: 6 inches.
 - 3. Blade Profile: Plain blade without center baffle.
 - 4. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch for blades and 0.080 inch for frames.
 - 5. Mullion Type: Concealed.
 - 6. Performance Requirements:
 - a. Free Area: Minimum 50 percent.

2.5 BLANK-OFF PANELS

- A. Insulated, Blank-Off Panels: Provide blank-off panel at each exterior louver unless noted otherwise.
- B. Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.
 - 1. Thickness: 1 inch.
 - 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
 - 3. Insulating Core: extruded-polystyrene foam.
 - 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
 - 5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 - 6. Panel Finish: Same type of finish applied to louvers, but black color.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range including custom colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

- D. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Sections include the following:
 - 1. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
 - 3. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory".
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 1396.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. Certainteed Gypsum.
 - c. G-P Gypsum.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. USG Corporation.
- B. Type X:
 - 1. Thickness: 5/8 inch.

2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
 3. Location: Vertical surfaces, unless otherwise indicated.
- C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
1. Products: Provide one of the following:
 - a. American Gypsum: M-bloc.
 - b. Certainteed: ProRoc Moisture and Mold Resistant Type X.
 - c. G-P Gypsum: ToughRock Fireguard Moisture-Guard.
 - d. Lafarge North America Inc.: Mold Defense, Type X.
 - e. National Gypsum Company: Gold Bond XP Gypsum Board.
 - f. United States Gypsum Company: Sheetrock Brand Mold Tough.
 2. Core: 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Location: Toilet rooms and where indicated.
- E. Abuse-Resistant Type: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.
1. Products: Provide the following:
 - a. Certainteed: ProRoc Abuse-Resistant Type X.
 - b. G P Gypsum: ToughRock Abuse-resistant.
 - c. Lafarge: Protecta AR 100.
 - d. National Gypsum Company; Gold Bond Hi-Impact XP Wallboard.
 - e. United States Gypsum Co.; FiberRock Abuse-Resistant Gypsum Panels.
 2. Core: 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Location: As indicated.

2.3 INTERIOR GYPSUM WALLBOARD FOR EXPOSED (UNENCLOSED) CONSTRUCTION

- A. Water-Resistant Gypsum Board Panels: mold and mildew resistant per ASTM D 3273.
1. Provide one of the following:
 - a. Glass-mat faced gypsum board, complying with ASTM C1177/C 1177M.
 - 1) Product: "DensArmor Plus Interior Guard" by G-P Gypsum.
 - b. Fiber-reinforced gypsum board, complying with ASTM C 1278.
 - 1) Product: USG Corporation: Fiberock Aqua-Tough.
 2. Core: 1/2 inch, regular type.
 3. Long Edges: Tapered.
 4. Application: Vertical surfaces and ceiling surfaces, unless otherwise indicated.
- B. Fire-rated Water-Resistant Gypsum Board Panels: mold and mildew resistant per ASTM D 3273.
1. Provide one of the following:
 - a. Glass-mat faced gypsum board, complying with ASTM C1177/C 1177M.
 - 1) "DensArmor Plus Fireguard Interior Guard" by G-P Gypsum Corp., (Level 10 of 10 per ASTM D 3273).

- b. Fiber-reinforced gypsum board, complying with ASTM C 1278.
 - 1) Product: USG Corporation: Fiberock Aqua-Tough.
- 2. Core: 5/8 inch, type X.
- 3. Long Edges: Tapered.
- 4. Application: Vertical surfaces and ceiling surfaces, where required for fire-resistance rating.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. National Gypsum: PermaBase.
 - d. USG Corporation; DUROCK Cement Board.
 - 2. Thickness: 1/2 inch.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, or plastic.
 - 2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. LC-Bead (J-Bead): Use at exposed panel edges.
 - c. Expansion (Control) Joint: Use where indicated.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide the Basis-of-Design product indicated, or comparable product approved by Architect from one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Profiles:
 - a. Extruded Aluminum Trim reveal molding (EAT-1): Basis-of-Design: Fry Reglet DRM-625-100; 5/8-inch depth, 1-inch width.
 - 3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
 - 4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.

- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- E. Joint Compound for Exterior Applications:
 - 1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- F. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 20 percent by weight.
- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- F. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
 - 1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Isolation Strip at Exterior Walls:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

H. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine weathertight building enclosure, with Installer present, and verify that delivery, storage, and installation of gypsum panel products will not be affected by exposure to moisture beyond limits recommended by manufacturer.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.
- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and

face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers and where indicated.
- C. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, or, if not shown, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. U-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
 - 3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
- E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.
 - g. Installation of through-penetration firestopping and fire-resistant joint sealants, with identification labels.

3.8 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic/Porcelain tile.
2. Waterproof membrane.
3. Metal Edge Strips
4. Crack isolation membrane.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Division 09 Section "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Deleted.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
 1. Full-size units of each type and composition of tile and for each color and finish required.
 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
 3. Stone thresholds in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
 - 5. Cementitious backer units.
 - 6. Metal edge strips.
- D. Deleted.

- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Finish Schedule or an Architect approved comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Daltile; Division of Dal-Tile International Inc.
 - d. Ergon
 - e. Florim USA
 - f. Interceramic.

2.3 TILE PRODUCTS

- A. Tile Type: porcelain tile.
 - 1. Module Size: As indicated on Finish Schedule.
 - 2. Tile Color: Selected by Owner.
 - 3. Grout Color: As selected by Architect from manufacturer's full range.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 1. Products: Noble Company (The); Nobleseal CIS.
- C. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.
 1. Products: Compotite Corporation; Composeal Gold.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 1. Products: Schluter Systems L.P.; KERDI.
- E. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
 1. Products: MAPEI Corporation; Mapelastic SM.

2.6 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Boiardi Products; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
 - c. Bostik, Inc.; Hydroment Blacktop 90210.
 - d. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - e. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - f. MAPEI Corporation; Mapelastic L (PRP M19).
 - g. Summitville Tiles, Inc.; S-9000.
- C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Boiardi Products; a QEP company; Elastiment 644 Membrane Waterproofing System.
 - b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane.
 - c. Bostik, Inc.; Hydroment Gold.
 - d. C-Cure; Pro-Red Waterproofing Membrane 63.

- e. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane.
- f. Jamo Inc.; Waterproof.
- g. Laticrete International, Inc.; Laticrete Watertight Floor N' Wall Waterproofing.
- h. MAPEI Corporation; Mapelastic HPG.
- i. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
- j. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

2.7 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 - 3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site or prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
 - 4. For installation of glass tile, provide white mortar.

2.8 GROUT MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
- C. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.9 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout. Provide product recommended or approved by manufacturer of grout.
- E. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for flooring applications.
 - 1. Schluter Transition: Schiene, Aluminum at tile to carpet and tile to tile transitions
 - 2. Schluter Transition: Reno-Ramp, Aluminum at tile to concrete transitions

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors composed of tiles 8 by 8 inches or larger.
 - b. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Paver Tile: 1/4 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend waterproofing under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Deleted.
2. Tile Installation F125A: Thin-set mortar on crack isolation membrane; TCNA F125A.
 - a. Tile Type: Mosaic tile and porcelain tiles with tile base.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Deleted
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- D. Qualification Data: For testing agency.
- E. Field quality-control test reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

- G. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- H. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- E. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide the products indicated in Part 3 of this section or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Ecophon CertainTeed, Inc.
 - 3. USG Interiors, Inc.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21, where indicated.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 4. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- G. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

2.4 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide product specified or a comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Celotex Corporation; Architectural Ceilings Marketing Dept.
 - 3. Chicago Metallic Corporation.
 - 4. Fry Reglet Corporation.
 - 5. Gordon, Inc.
 - 6. MM Systems, Inc.
 - 7. USG Interiors, Inc.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's

designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Wall Angle:
 - a. Armstrong Seismic RX with BERC2 Clips.
 - b. Size: 7/8".
 - c. Color: factory painted to match ceiling grid.
 2. For sprinkler heads and other penetrations, provide 2-inch oversized ring or sleeve through the ceiling to allow for free movement of at least 1 inch in all horizontal directions.
- C. Expansion Joint: 1 inch ceiling expansion joint with 100% movement capability equal to MM Systems CX series.

2.5 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Acoustical Sealant for Concealed Joints:
 - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Install Armstrong Seismic RX in accordance with manufacturer's written recommendations with all accessories necessary to comply with ICC Report ESR-1308.
 - 2. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 3. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 4. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels in a basket-weave pattern.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 - 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:
 1. Suspended ceiling system.
 2. Hangers, anchors and fasteners.
- B. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 ACOUSTICAL PANEL CEILING SCHEDULE

- A. Acoustical Ceiling Type ACT-1: Provide acoustical panels complying with the following:
 1. Basis of Design: Armstrong World Industries, "School Zone, fine fissured" (Basis of Design).
 2. Color: White.
 3. Light Reflectance Coefficient: Not less than LR 0.84.
 4. Noise Reduction Coefficient: NRC 0.70
 5. Edge Detail: Square.

6. Thickness: 5/8 inch.
 7. Size: 24 by 24 inches.
- B. Acoustical Ceiling Type ACT-2: Provide acoustical panels complying with the following:
1. Basis of Design: Armstrong World Industries "Clean Room VL, unperforated"(Basis-of-Design)
 2. Light Reflectance Coefficient: Not less than LR 0.84.
 3. Noise Reduction Coefficient: NRC 0.70
 4. Edge Detail: Square.
 5. Thickness: 5/8 inch.
 6. Size: 24 by 24 inches.

3.7 SUSPENSION SYSTEM SCHEDULE

- A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; "Prelude XL Exposed Tee" 15/16" system.
 - b. USG Interiors, Inc.; "Donn Brand DX" 15/16" System.
 2. Structural Classification: Heavy-duty system.
 3. End Condition of Cross Runners: Override (stepped) type.
 4. Face Design: Flat, flush.
 5. Cap Material, Typical: Manufacturers standard.
 6. Cap Finish: Painted white, unless noted otherwise (stairwells to be RAL color of ceiling tile.)

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
- B. Related Sections: Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Flooring; Endura
 - 2. Johnsonite. (Basis of Design)
 - 3. Marley Flexco
 - 4. Nora Systems, Inc.
 - 5. Roppe Corporation

2.2 RESILIENT BASE

- A. Resilient Base: Resilient Base Standard, ASTM F 1861. Type TS (Rubber, vulcanized thermoset), Group I (solid, homogeneous). Coils in lengths standard with manufacturer, but not less than 96 feet.
 - 1. Style: Cove (base with toe).
 - 2. Minimum Thickness: 0.080 inch.
 - 3. Height: 6 inches in wet areas; 4 inches unless otherwise indicated.
 - 4. Outside, Inside Corners: Preformed.
 - 5. Colors, Finish, and Patterns: As selected by Architect from full range of industry colors.

2.3 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, transition strips, reducer strip for resilient flooring.
- B. Material: Rubber.
- C. Profile and Dimensions: As indicated.
- D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Preformed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
- E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Gypsum board.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 099600 "High-Performance Coatings" for high-performance and special-use coatings.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Deleted.
- C. Deleted.

- D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 Deleted.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of following.
 1. Benjamin Moore & Co.
 2. Glidden Professional.
 3. PPG Architectural Finishes, Inc.
 4. Sherwin-Williams; Paint Stores Group

- B. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 100 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- D. Colors: As indicated on Finish Legend.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.
 - 1. PPG (formerly ICI Paints): Devoe Paint, Primz220 Interior/Exterior Latex Block Filler.
 - 2. Duron, Inc.: Dura Crete H.P. Acrylic Block Filler, SBPR00.
 - 3. Sherwin-Williams Company (The): PrepRite Interior/Exterior Block Filler, B25W25.

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
- B. Primer, Galvanized, Water Based: MPI #134.
- C. Primer, Quick Dry, for Aluminum: MPI #95.

2.6 WATER-BASED PAINTS

- A. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.
- B. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145.
- C. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.

2.7 FLOOR COATINGS

- A. Sealer, Water Based, for Concrete Floors: MPI #99.

2.8 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.

- e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
- 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Traffic Surfaces (CSL-1):
- 1. Water-Based Clear Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, MPI #99.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- B. Steel Substrates:
- 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- C. Galvanized-Metal Substrates:
- 1. Latex over Waterborne Primer System: MPI INT 5.3J.
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - 2. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- D. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.4H.
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.
- E. Gypsum Board Substrates:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat for ceilings and soffits: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.
 - d. Topcoat, walls, unless noted otherwise: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Section 012300 Alternates for work applicable to this section.

1.2 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
 - b. Galvanized metal.
 - 2. Interior Substrates:
 - a. Concrete masonry units (CMU).
 - b. Steel.
 - c. Gypsum board.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 09 painting Sections for special-use coatings and general field painting.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Deleted
- C. Deleted

- D. Deleted

- E. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.
- B. Deleted

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. Provide products of same manufacturer for each coat in a coating system.
- B. Colors: As indicated on Finish Schedule.

2.2 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI#4.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Benjamin Moore & Co.; Moorcraft, Super Craft Latex Block Filler, 285-01.
- b. Devoe Coatings; Bloxfil 4000 Heavy Duty Acrylic Block Filler.
- c. Akzo Nobel Paints; 3010 Paints; Devoe Coatings, Bloxfil Acrylic Block Filler, 4000.
- d. PPG Architectural Finishes, Inc.; Interior/Exterior Latex Block Filler, 6-12.
- e. Sherwin-Williams Company (The); PrepRite, Int/Ext Block Filler, B25W25.(two coats) or Heavy Duty Block Filler B42W00046 (one coat.)

2.3 METAL PRIMERS

A. Galvanized Metal Primers

- 1. Benjamin Moore & Co.; Devran 203 or 205.
- 2. Aquapon Primer 97-145 or 97-846.

B. Inorganic Zinc Primer: MPI #19.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Inorganic Zinc Primer, M01/M02.
 - b. Akzo Nobel Paints; Devoe Coatings, Catha-Cote 304, 304.
 - c. PPG Architectural Finishes, Inc.; Metalhide One-Pac, Inorganic Zinc Rich Primer, 97-676.
 - d. Sherwin-Williams Company (The); Industrial & Marine, Zinc Clad II Ethyl Silicate, B69V3/D11.
 - e. Tnemec: 90-97 Tneme-Zinc.

C. Cold-Curing Epoxy Primer: MPI #101.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Akzo Nobel Paints; Bar-Rust 235, Multi-Purpose Epoxy Coating, DC235K3501.
 - b. Sherwin-Williams Company (The); Industrial & Marine, Duraplate 235 Multi-Purpose Epoxy, B67W235.

2.4 EXTERIOR EPOXY COATINGS

A. Epoxy, Cold-Cured, Gloss: MPI #77.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Polyamide Epoxy Coating, M36/M37.
 - b. Akzo Nobel Paints; Devoe/Fuller, Guardcote, DP34UXX.
 - c. PPG Architectural Finishes, Inc.; Aquapon, Epoxy Cold Cured Gloss, 95-1.
 - d. Sherwin-Williams: Tile-Clad High Solids Epoxy Coating. B 62 Series.

B. High-Build Epoxy Marine Coating, Low Gloss: MPI #108.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Epoxy Mastic Coating, M45/M46.
 - b. Akzo Nobel Paints; Devoe Coatings, Bar-Rust 236, 236.
 - c. PPG Architectural Finishes, Inc.; Aquapon, High Build Epoxy Marine Coating, 97-130/97-139.
 - d. Sherwin-Williams Company (The); Industrial & Marine, Macropoxy 646, B58W6 Series.
 - e. Tnemec: Series 66 High-build Epoxoline II.

2.5 INTERIOR EPOXY COATINGS

A. Epoxy-Modified Latex, Interior, Gloss: MPI #115.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Waterborne Polyamide Epoxy Gloss, P42.
 - b. Akzo Nobel Paints; Devoe Paints, Tru-Glaze-WB Waterborne Epoxy Gloss, 4428/4420.

- c. PPG Architectural Finishes, Inc.; Pitt-Glaze Water-Borne Acrylic Epoxy, 16-598.
- d. Sherwin-Williams Company; Industrial & Marine, Water Based Catalyzed Epoxy, B70W00200/B60V00015.
- B. Epoxy-Modified Latex, Interior, Semi-Gloss: MPI #215.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Acrylic Epoxy Coating/Semi-Gloss Catalyst, P43/KP43.
 - b. Akzo Nobel Paints; Devoe Paints, Tru-Glaze-WB Waterborne Epoxy Semi-Gloss Coating, 4426-4420.
 - c. PPG Architectural Finishes, Inc.; Pitt-Glaze Water-Borne Acrylic Epoxy, 16-599.
 - d. Sherwin-Williams Company; Pro Industrial, Pre-Catalyzed Waterbased Epoxy, K46 Series.

2.6 POLYURETHANE COATINGS

- A. Polyurethane, Two-Component, Pigmented, Low Luster:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Aliphatic Acrylic Urethane Gloss, DM74.
 - b. Akzo Nobel Paints; Devoe Coatings, Devthane Aliphatic Urethane Semi-gloss, 378H.
 - c. PPG Architectural Finishes, Inc.; Pitthane, Urethane Aliphatic Pigmented Semi-Gloss, 95-849.
 - d. Shewin-Williams: Corothane II Polyurethane.
 - e. Tnemec: Series 73 Endura-Shield.
- B. Polyurethane, Two-Component, Pigmented, Gloss: MPI #72.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Aliphatic Acrylic Urethane Gloss, CM74/M75.
 - b. Akzo Nobel Paints; Devoe Coatings, Devthane Aliphatic Urethane, 369.
 - c. PPG Architectural Finishes, Inc.; Pitthane, Urethane Aliphatic Pigmented Gloss, 95-850.
- C. Two-Component, Aliphatic Polyurethane, Clear: MPI #78.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore & Co.; Aliphatic Acrylic Urethane Clear, CM7400
 - b. PPG Architectural Finishes, Inc.; Pitthane, Polyurethane Aliphatic 2 Comp. Clear, 95-8000.
 - c. Tnemec: Series 76 Endura Clear.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Masonry (Clay and CMU): 12 percent.
 - b. Gypsum Board: 12 percent.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION, GENERAL

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
- D. CMU Substrates: Remove efflorescence and chalk, dust, dirt, release agents, grease and oils. Mechanically remove glaze, if necessary to ensure bonding. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale.
 1. Clean using methods recommended in writing by coating manufacturer.
 2. Blast clean according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning ."
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 PREPARATION OF CMU SUBSTRATES

- A. Block Filler: Fill voids and depressions in block and mortar joints to full flush condition.
 1. Apply the surfacer (8 mils wet – 3.2 mils dry) using a 1-1/4 inch roller nap until voids appear to be filled. Immediately squeegee the entire surface using a 7 inch to 9 inch squeegee in a figure eight motion to push the filler into all voids and create a flush surface. Allow to dry according to manufacturer's recommendations, but not less than two hours or more than four hours. Sand to remove edges and irregularities. Recoat and repeat process as necessary to fill all voids flush with surface.
- B. Prime/Sealer Coats: Before application of finish coats, apply a prime coat, as recommended by the manufacturer, to material required to be coated or finished, and which has not been prime coated by others.
 1. Fill voids and depressions in block and mortar joints to full flush condition.
 2. Recoat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3.4 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
 1. Use applicators and techniques suited for coating and substrate indicated in accordance with manufacturer's directions and as specified.
 - a. For epoxy coating, use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.5 FIELD QUALITY CONTROL

- A. Block Filler: Notify the Architect of completion of block filler application, to schedule mandatory inspection. Do not apply finish coats over block filler until block filler application is approved by the Architect's Representative.
- B. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:
 1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with specified requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.6 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.7 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates: Architecturally exposed structural steel and where indicated.
 1. Polyurethane, Pigmented Coating System: 5.3L (sim.)
 - a. Prime Coat: Shop primed.
 - b. Intermediate Coat: High-build epoxy marine coating, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, low-luster.

- d. Topcoat: Polyurethane, two-component, clear, gloss, MPI #78.
- B. Galvanized-Metal Substrates: Architecturally exposed structural steel, handrails and where indicated.
 - 1. Polyurethane, Pigmented Coating System: 5.3L (sim.)
 - a. Prime Coat: Cold-curing epoxy primer, MPI #101.
 - b. Intermediate Coat: High-build epoxy marine coating, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss, MPI #72.
 - d. Topcoat: Polyurethane, two-component, clear, gloss, MPI #78.

3.8 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

- 1. Epoxy Coating System: MPI # 4.2G: (For wet environments, per MPI)
 - a. Prime Coat: Epoxy block filler, MPI #116.
 - b. Intermediate Coat: Epoxy, cold-cured, gloss, MPI #77.
 - c. Topcoat: Epoxy, cold-cured, gloss, MPI #77.

B. Steel Substrates (handrails at multi-purpose room platform only):

- 1. Polyurethane, Pigmented, Over High-Build Epoxy Coating System:
 - a. Prime Coat: Cold-curing epoxy primer, MPI #101.
 - b. Intermediate Coat: High-build epoxy marine coating, low gloss, MPI #108.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss, MPI #72.

END OF SECTION 099600

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toilet accessories.
 - 2. Childcare accessories.
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet Compartments" for compartments and screens.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. General Warranty: Special warranty 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. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
 - 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories indicated in the schedule at the end of Part 3 or approved substitute by one of the following:
- B. Toilet and Bath Accessories:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
- C. Underlavatory Guards:
 - 1. Brocar Products, Inc.
 - 2. Plumberex Specialty Products, Inc.
 - 3. TCI Products
 - 4. Truebro, Inc.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- C. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
- E. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

2.3 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET ACCESSORY SCHEDULE

<u>Type</u>	<u>Description</u>	<u>Product</u> (Bobrick unless otherwise noted)
GB18	Grab Bar	B-6806, 18-inch.
GB36	Grab Bar	B-6806, 36-inch
GB42	Grab Bar	B-6806, 42-inch.
MF	Tempered mirror, framed	B-165, 24" x 36"
MH	Mop Hook	B-224, 3-hooks; 4-holders
ND.1	Napkin Disposal	B-354
ND.2	Napkin Disposal	B-353, partition mounted
SD	Soap Dispenser	Owner Furnished/Contractor Installed
TTH	Toilet Tissue Holder	Owner Furnished/Contractor Installed
UL	Underlavatory Guard	Truebro Inc, Lav-Guard
PT	Paper Towel Dispenser	Owner Furnished/Contractor Installed
SND	Sanitary Napkin/Tampon Dispenser	B-3706-50, semi-recessed. Coin Operated; Tumbler type lockset with separate lock and Key for coin box; Capacity: 31 sanitary napkins, 22 tampons

END OF SECTION 102800

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire Protection Cabinets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguishers. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.
- D. Product Schedule: For fire extinguishers and fire protection cabinets. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
- C. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.7 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - 1. Finish: Factory primed for field painting.
- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
- C. Aluminum: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 for extruded shapes.
 - 1. Finish: Mill finish.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - h. Larsen's Manufacturing Company.
 - i. Potter Roemer LLC.
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.
 - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets FE: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Larsen's Manufacturing Company.
 - h. Potter Roemer LLC.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
- C. Orientation: Vertical

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide recessed fire protection cabinets.
 - 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- D. Provide fire extinguishers for each cabinets and mounting brackets indicated.
- E. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104400

SECTION 22 0500 - GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. The Plumbing Work shall include, but not be limited to, the following:

1. Soil and waste and vent systems
2. Domestic water systems
3. Domestic water heating
4. Gas piping systems

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 DELINEATION OF WORK:

- A. Provide all necessary supervision and coordination of information to installers who are performing work to accommodate Division 22 installations.
- B. Where the Division 22 installer is required to install items which they do not purchase, they shall include for such items:
1. The coordination of their delivery.
 2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
 3. Their safe handling and field storage up to the time of permanent placement in the project.
 4. The correction of any damage, defacement or corrosion to which they may have been subjected.
 5. Their field assembly and internal connection as may be necessary for their proper operation.
 6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.

- 7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
- C. Items which are to be installed by the Division 22 installer but not purchased as part of the work of Division 22 shall be carefully examined upon delivery to the project. The Division 22 installer shall provide all work necessary to properly install these items.
- D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the A/E shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the A/E.

1.4 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.
- B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- C. All equipment of one type (such as valves, etc.) shall be the products of one manufacturer unless specifically stated otherwise.
- D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
- E. All materials with a manufacturers listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.
- B. All work shall conform to the following Building Codes (latest edition):
 - 1. International Building Codes
 - 2. National Fire Protection Association

- C. All work shall conform to all federal, state, and local ordinances.
- D. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:
 - 1. Factory Mutual Laboratories (FM)
 - 2. Underwriters Laboratories, Inc. (UL)
- E. All fuel fired equipment shall meet the requirements of the insurers and agencies listed and also meet the owner's insurer requirements.

1.6 STANDARDS AND PROCEDURES:

- A. All work shall meet or exceed the standards and procedures of the following:
 - 1. AGA: American Gas Association
 - 2. ANSI: American National Standards Institute
 - 3. API: American Petroleum Institute
 - 4. ASME: American Society of Mechanical Engineers
 - 5. ASTM: American Society of Testing and Materials
 - 6. AWWA: American Water Works Association
 - 7. IBR: Institute of Boiler and Radiator Manufacturers
 - 8. MSS: Manufacturers Standardization Society
 - 9. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors
 - 10. NEMA: National Electrical Manufacturer's Association
 - 11. OSHA: Occupational Safety & Health Administration
 - 12. IRM: Improved Risk Mutuals

1.7 "OR EQUAL" CLAUSE:

- A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make, or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E, expressed in writing, is equal to that specified.

- B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval, to the A/E, in accordance with APPROVALS OF SUBSTITUTIONS.

1.8 APPROVAL OF SUBSTITUTIONS:

- A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the A/E shall be final and bind all parties concerned.
- B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to bid opening date to the A/E. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.
- C. Approval of the A/E to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.
- D. Submittals for bidding are not required on items specified by model number or when a manufacturer listed by name can provide equipment with no deviations from the specifications. Submit all other items for approval.
- E. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the A/E, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.9 VERIFICATION OF DIMENSIONS AND LOCATIONS:

- A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.
- B. Notify the A/E of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.10 EQUIPMENT CONNECTIONS:

- A. The contract documents may indicate specific electrical, HVAC, and plumbing connection locations to equipment. Each manufacturer approved for bidding may have different connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.
- B. The Contractor shall bear all costs for required changes in connection to equipment.

1.11 WORKMANSHIP:

- A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.
- B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on job site and submit others for approval when required.

1.12 GUARANTEES AND WARRANTIES:

- A. General:
 - 1. Furnish to the A/E a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
 - 2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.
- B. Equipment Warranties:
 - 1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at his option, may permit the contractor to provide the required repairs on the equipment.
 - 2. The equipment manufacturer shall include a written guarantee with the closeout documentation.
- C. Duration Period:
 - 1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
 - 2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.
- D. Extended Warranties:

1. Warranty periods shall be extended where specifically stated in these specifications.
 2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
 3. The extended warranty time listed is time in addition to the base warranty period.
- E. Non-Warranted Items:
1. Non durable replaceable items do not require replacement after the date of acceptance.
- F. Warranty Repair:
1. Repair shall take place as soon as possible but not later than the following:
 - a. Items not essential for facility operation - 7 days.
 - b. Items that have a small impact on facility operation - 2 days.
 - c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.
 2. The determination of the impact on the facility is solely that of the Owner and A/E.
 3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
 4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
 5. All costs associated with warranty work shall be borne by the contractor.

1.13 Deleted

1.14 WELDER REQUIREMENTS:

- A. All welders shall be certified by the Welding Bureau of the Mechanical Contractors Association of America. The welders shall be certified for type of welding procedure applicable to the project.
- B. Welding shall be performed in accordance to the applicable welding procedure specification (WPS). Separate WPS are required for different welding methods and materials as set forth in ASME Boiler and Pressure Vessel Code, Section IX.

- C. Welders, welding test and welding procedures shall comply with the following:
 - 1. Applicable sections of ASME B31 standard, Code for Pressure Piping.
 - 2. ASME Boiler and Pressure Vessel Codes.
 - 3. Standard D9.1 for arc welded and braze welded duct.
- D. The different type of welding processes include, but are not limited to:
 - 1. SMAW (Shielded metal arc welding).
 - 2. GMAW (Gas metal arc welding or MIG).
 - 3. GTAW (Gas tungsten arc welding or TIG/Heliarc).
- E. The Contractor shall be prepared to provide the following tests and reports prior to beginning construction.
 - 1. Qualification test of each welder prior to beginning construction.
 - 2. One sample of welding of each welder's work selected at random by A/E if requested during construction period.
- F. Submit welder qualifications to A/E.

1.15 EXISTING FACILITIES:

- A. The location of duct, pipe, fixtures, equipment and appurtenances for existing facilities are shown on plans to indicate the extent of work required. Exact condition shall be field verified.
- B. Work shall be performed above existing ceilings except where removal of existing ceilings is specifically identified. Where working above existing ceilings, remove existing tile/grid and reinstall existing tile/grid as necessary. Any damaged tile/grid shall be replaced at the Contractor's expense.

PART 2 - PRODUCTS: (NOT USED)

PART 3 - EXECUTION:

3.1 PRIOR CONDITIONS:

- A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.
- B. If the prior work does not make a proper installation of any equipment or system component possible, notify the A/E prior to installation of any equipment or system component.

3.2 INSTALLATION:

- A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.
- B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the A/E in writing prior to installation of equipment.
- C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the A/E in writing prior to installation of the system component.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT:

- A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the A/E, at no cost to the Owner.
- B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.
- C. Piping shall be protected by storing it on elevated supports and capping the ends.
- D. During construction, all open ends of pipe, floor drains, etc. which could collect construction debris shall be properly capped.

3.4 CLEANING OF SYSTEMS AND EQUIPMENT:

- A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.
- B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.
- C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.

3.5 SUPPORT OF SYSTEMS:

- A. Hanging piping or equipment from un-reinforced metal roof decks (i.e., metal roof deck w/o concrete is not permitted).
- B. The following methods of support are not permitted.
 - 1. Wire hangers unless specifically indicated.
 - 2. Perforated straps.

END OF SECTION 22 0500

SECTION 22 0501 – COMMON PLUMBING MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the mechanical systems where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
 1. AISC Steel Handbook
- B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.
- C. Manufacturers:
 1. The following paint manufacturers are acceptable:
 - a. Glidden
 - b. Sherwin-Williams
 - c. Devoe Paints
 2. The following caulking manufacturers are acceptable:
 - a. TREMCO
 - b. Sonneborn - Contech
 - c. W. R. Meadows

PART 2 - PRODUCTS

2.1 PRODUCT REFERENCES:

- A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment.

1. Roof curbs and piping support curbs shall be provided for all flues and piping located on a roof.

2.2 PAINT:

A. General:

1. Painting shall be in strict accordance with the paint manufacturer with regards to surface preparation, priming, and finish painting.
2. High temperature paint, chemical resistant paint, and similar special paints shall be provided as required for specific application.
3. Color shall be as selected by A/E. Color can be any available color from manufacturer.
4. In addition to prime coat, two finish coats shall be applied.

B. The following items shall not be painted unless specifically specified otherwise:

1. Concealed Supports and Accessories
2. Hot Dipped Galvanized Steel
3. Stainless Steel
4. Aluminum
5. Threaded Rods
6. Factory Painted Items

C. In addition to equipment and materials specified elsewhere to be painted, the following shall be painted (except where excluded elsewhere in this section of specifications):

1. All hangers, non-threaded rods, fasteners, supports, and accessories where not located in concealed locations.

D. Paint shall be:

1. Glidden Industrial Enamel
2. Sherwin-Williams Industrial Enamel
3. Devco Paints Industrial Enamel

2.3 FLASHING:

A. General:

1. Provide flashing and counter flashing on all pipes, flues, and other plumbing system components which penetrate exterior walls or roofs.
2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. Plumbing Vents:

1. Plumbing vents through the roof shall be flashed and made watertight using 4-pound sheet lead.

C. Plumbing Pipe:

1. See detail on plans. Refer to architectural and roof plans.

2.4 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.
- B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.5 FASTENERS, ANCHORS, AND ACCESSORIES:

- A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic.
- B. Materials provided shall be considered industry standard for commercial or industrial use.
- C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.
- D. Materials installed outdoors, in attics, in crawl spaces, in tunnels and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.

2.6 SEALANT:

- A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.
- B. Penetrations and fire rated assemblies shall meet the requirements of the Firestopping and Smokestopping specification.
- C. Color shall be approved by A/E.

PART 3 - EXECUTION

3.1 FLASHING:

A. Plumbing Vents:

1. Metal flashing shall extend at least 12" in all directions from pipe and be turned down a minimum of 3" inside top of pipe.

2. Rubber flashing shall be secured to pipe with stainless steel clamps.

3.2 EQUIPMENT INSTALLATION (SLABS NOT ON GRADE):

- A. Submit to the A/E a detailed description and sketches indicating the method of transporting heavy equipment within the building to its final installed location.
- B. The submittal shall indicate maximum point loading on the structure, method to distribute load, and shoring of structure.

3.3 PAINTING:

- A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.
- B. All conditions that prohibit proper application of paint shall be reported in writing to the A/E.
- C. Submit manufacturer of paint, type, and paint color samples to the A/E for review.

3.4 EQUIPMENT STORAGE:

- A. Facilities for storing materials and equipment shall be provided by the Contractor.
- B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.
- C. All stored items shall be elevated off slab or grade.

3.5 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Run vents and reliefs to location indicated on plans or, if none indicated, to a location where they can discharge safely without presenting a hazard to personnel. Terminate with appropriate fitting.
- B. Run overflow similar to drain.

3.6 EXTERIOR SEALANT:

- A. Submit color charts to A/E.

3.7 EQUIPMENT PENETRATIONS:

- A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.8 EQUIPMENT INSTALLATION:

- A. Repair all insulation damaged during installation of equipment.

SECTION 22 0501 – COMMON PLUMBING MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the mechanical systems where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
 1. AISC Steel Handbook
- B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.
- C. Manufacturers:
 1. The following paint manufacturers are acceptable:
 - a. Glidden
 - b. Sherwin-Williams
 - c. Devoe Paints
 2. The following caulking manufacturers are acceptable:
 - a. TREMCO
 - b. Sonneborn - Contech
 - c. W. R. Meadows

PART 2 - PRODUCTS

2.1 PRODUCT REFERENCES:

- A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment.

1. Roof curbs and piping support curbs shall be provided for all flues and piping located on a roof.

2.2 PAINT:

A. General:

1. Painting shall be in strict accordance with the paint manufacturer with regards to surface preparation, priming, and finish painting.
2. High temperature paint, chemical resistant paint, and similar special paints shall be provided as required for specific application.
3. Color shall be as selected by A/E. Color can be any available color from manufacturer.
4. In addition to prime coat, two finish coats shall be applied.

B. The following items shall not be painted unless specifically specified otherwise:

1. Concealed Supports and Accessories
2. Hot Dipped Galvanized Steel
3. Stainless Steel
4. Aluminum
5. Threaded Rods
6. Factory Painted Items

C. In addition to equipment and materials specified elsewhere to be painted, the following shall be painted (except where excluded elsewhere in this section of specifications):

1. All hangers, non-threaded rods, fasteners, supports, and accessories where not located in concealed locations.

D. Paint shall be:

1. Glidden Industrial Enamel
2. Sherwin-Williams Industrial Enamel
3. Devco Paints Industrial Enamel

2.3 FLASHING:

A. General:

1. Provide flashing and counter flashing on all pipes, flues, and other plumbing system components which penetrate exterior walls or roofs.
2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. Plumbing Vents:

1. Plumbing vents through the roof shall be flashed and made watertight using 4-pound sheet lead.

C. Plumbing Pipe:

1. See detail on plans. Refer to architectural and roof plans.

2.4 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.
- B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.5 FASTENERS, ANCHORS, AND ACCESSORIES:

- A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic.
- B. Materials provided shall be considered industry standard for commercial or industrial use.
- C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.
- D. Materials installed outdoors, in attics, in crawl spaces, in tunnels and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.

2.6 SEALANT:

- A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.
- B. Penetrations and fire rated assemblies shall meet the requirements of the Firestopping and Smokestopping specification.
- C. Color shall be approved by A/E.

PART 3 - EXECUTION

3.1 FLASHING:

A. Plumbing Vents:

1. Metal flashing shall extend at least 12" in all directions from pipe and be turned down a minimum of 3" inside top of pipe.

2. Rubber flashing shall be secured to pipe with stainless steel clamps.

3.2 EQUIPMENT INSTALLATION (SLABS NOT ON GRADE):

- A. Submit to the A/E a detailed description and sketches indicating the method of transporting heavy equipment within the building to its final installed location.
- B. The submittal shall indicate maximum point loading on the structure, method to distribute load, and shoring of structure.

3.3 PAINTING:

- A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.
- B. All conditions that prohibit proper application of paint shall be reported in writing to the A/E.
- C. Submit manufacturer of paint, type, and paint color samples to the A/E for review.

3.4 EQUIPMENT STORAGE:

- A. Facilities for storing materials and equipment shall be provided by the Contractor.
- B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.
- C. All stored items shall be elevated off slab or grade.

3.5 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Run vents and reliefs to location indicated on plans or, if none indicated, to a location where they can discharge safely without presenting a hazard to personnel. Terminate with appropriate fitting.
- B. Run overflow similar to drain.

3.6 EXTERIOR SEALANT:

- A. Submit color charts to A/E.

3.7 EQUIPMENT PENETRATIONS:

- A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.8 EQUIPMENT INSTALLATION:

- A. Repair all insulation damaged during installation of equipment.

END OF SECTION 22 0501

SECTION 22 0601 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of hydronic specialties where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures (latest editions) of the following:
 - a. USA Standard Face to Face Dimensions of Ferrous Flanged Valves ANSI B16.10.
 - b. USA Standard for Cast Iron Pipe Flanges and Flanged Fittings. ANSI B16.1.
 - c. SHEMA.

- B. All pressure vessels including expansion tanks, air separators and similar equipment shall be constructed, tested and stamped in accordance with ASME standards.

- C. Equipment shall be stamped for (125) (250) psig working pressure.

D. Manufacturers:

1. The following all bronze strainer manufacturers are acceptable:
 - a. Sarco
 - b. Mueller
 - c. Armstrong
 - d. Apollo
2. The following expansion tank (domestic) manufacturer's are acceptable:
 - a. Amtrol

- b. Therm – X-Trol
 - c. Wessels
- 3. The following dielectric fitting manufacturers are acceptable:
 - a. Perfection Corporation
 - b. Victaulic

PART 2 - PRODUCTS

2.1 STRAINERS:

- A. All strainers shall have bronze bodies of ample strength for the pressure to which they shall be subjected, removable cylindrical or conical screens of Monel or stainless steel and suitable flanges or tappings to connect with the piping they serve. They shall be of such a design as to allow discharge of accumulated dirt, and to facilitate removal and replacement of a strainer screen, without disconnection from the main piping.
- B. Strainer screen perforations shall be:
 - 1. Water (up to 3") - 1/16"
 - 2. Water (4" thru 12") - 1/8"
- C. All strainers shall be provided with flanged covers for screen removal in lieu of screwed covers wherever obtainable.
- D. All strainers in piping, (including all pump inlets), shall be Y-pattern, set in a horizontal (or vertical downward) run of the pipe. Where this is not feasible, strainers may be of enlarged cross-section type.
- E. Provide a valve dirt blowoff with each strainer 2-1/2" and larger.
- F. Provide a 6" capped nipple for strainers 2" and smaller.

2.2 UNIONS AND FLANGES:

- A. Steel pipe:
 - 1. Unions shall be malleable iron, zinc coated, ground joint type for steel pipe.
- B. Copper tubing and pipe:
 - 1. Unions shall be brass.
- C. Flanges or unions shall be installed in the following locations:
 - 1. At locations indicated on plans.
 - 2. At equipment to permit mechanical removal of equipment.

3. At equipment to permit servicing.
4. At pressure reducing valves to permit mechanical removal of the valve.

2.3 DRAINS

- A. Drains are to be provided as follows:
 1. Provide hose and drain valves near the heel of all main water risers in an accessible location. Drain shall be 3/4" or size indicated, whichever is larger.
 2. Provide drain valves for complete drainage of piping, including the system side of all pumps. Drain shall be 3/4" or size indicated, whichever is larger.
- B. Provide deep seal P-traps from all condensate drain pans.

2.4 EXPANSION TANK (DOMESTIC):

- A. Tanks shall be constructed of steel in accordance with ASME standards.
- B. Tank shall be painted on the exterior with a rust inhibiting paint.
- C. Tank shall have a precharged air chamber, heavy duty butyl diaphragm and rigid polypropylene liner.
- D. Tank shall be equipped with:
 1. Stainless steel connections.

2.5 DIELECTRIC FITTINGS:

- A. Dielectric nipples shall have a high temperature, inert, thermoplastic copolymer liner. The nipple shall be electro-zinc plated steel. Current flow across a 3/4" nipple shall not exceed .010 ma.
- B. Provide dielectric fittings:
 1. To isolate dissimilar metals in piping systems
 2. At connections to all water heaters
 3. At water lines at building entrance points
 4. To isolate dissimilar metals in piping systems and equipment
- C. Dielectric fitting shall be:
 1. Dielectric nipple

PART 3 - EXECUTION

3.1 STRAINERS:

- A. There shall be approved strainers in the inlet connections to each pump, each automatic valve, each pressure reducing valve, and as shown on drawings.
- B. Strainers shall be so arranged as not to "trap" lines and to facilitate disconnection and opening-up for cleaning. Unless otherwise indicated, strainers shall be line size.
- C. Dirt blow-off valves shall be 6" to 1'-0" below strainer or as directed. Nipples and valves to be full size of strainer blow-off tapping. For all strainers, the blowout connection is to terminate in an approved manner, at a point where there will be no risk of flooding or damage.
- D. All strainers installed in horizontal piping shall be installed flat (on side) except strainers at pumps shall be installed in a vertical position.

3.2 EXPANSION TANK (GENERAL):

- A. Provide threaded rod supports mounted to building structure to support tank.
- B. Tanks over 50 gallons shall be provided with a steel support saddle.

END OF SECTION 22 0601

SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including valves, mechanical couplings, fittings, flanges, strainers, expansion joints, and appurtenances where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 22 0700 – Plumbing Insulation

1.3 QUALITY ASSURANCE:

A. Manufacturers:

1. The following fiberglass piping insulation manufacturers are acceptable:
 - a. Owens/Corning
 - b. Knauf
 - c. Johns Manville
2. The following elastomeric pipe insulation manufacturers are acceptable:
 - a. Armacell
 - b. K-Flex
 - c. Nomaco Insulation
3. The following aluminum jacket manufacturers are acceptable:
 - a. Childers
 - b. RPR Products
4. The following stainless steel jacket manufacturers are acceptable:
 - a. Childers
 - b. RPR Products

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.

2.2 TYPES OF INSULATION:

A. Fiberglass Insulation:

- 1. Physical properties:
 - a. Thermal conductivity (k) is 0.25 at 100 degrees F.
- 2. Jacket:
 - a. ASJ jacket with or without self-sealing adhesive system.
- 3. Insulation shall be:
 - a. Owens/Corning Heavy Density Fiberglass Insulation ASJ/SSL or ASJ

B. Elastomeric Insulation:

- 1. General:
 - a. The insulation shall have a factory applied adhesive closure system.
- 2. Physical properties:
 - a. Thermal conductivity (k) is 0.27 at 75 degrees F.
 - b. Water transmission is 0.08 perms - inch.
 - c. Will not significantly contribute to fire.
- 3. Insulation shall be:
 - a. Armacell type AP Armaflex SS
 - b. K-Flex USA type LS Seam-Seal or Insul-Lock
 - c. Nomaco Insulation FlexTherm

2.3 PIPE INSULATION APPLICATION:

A. General:

- 1. All fittings, valves, and accessories in the piping system shall be insulated similar to the piping system.

2. Insulation in return air plenums shall have a flame/smoke rating not to exceed 25/50.

B. Fiberglass Pipe Insulation:

1. Fiberglass pipe insulation is required for the following piping systems:
 - a. Indoor piping up to 850 degrees F except for those where other types of pipe insulation is specified.

C. Elastomeric and Polyolefin Pipe Insulation:

1. Elastomeric and polyolefin pipe insulation is only permitted on the following:
 - a. Piping concealed in walls, partitions and chases.
 - b. Where details or notes specifically allow the use of elastomeric or polyolefin insulation.

2.4 FITTINGS:

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Fiberglass Pipe Insulation:

1. Piping (up to 1-1/4"):
 - a. Fittings may be mitered at contractor's option.
2. Piping (1-1/2" and larger):
 - a. Fittings shall be insulated with 3/4 PCF density, all service faced FSK duct wrap, 2" thick.

C. Elastomeric and Polyolefin Pipe Insulation:

1. Piping (up to 3/4"):
 - a. Fittings may be mitered at contractor's option.

D. All Other Insulation:

1. Piping (all sizes)
 - a. Per manufacturer's recommendations.

2.5 JACKETING:

A. Aluminum Jacketing:

1. General:

- a. Jacketing shall be manufactured from Type 1100, 3003, 3105 and 5005 alloys.
- b. Jacketing on piping shall be corrugated. Corrugation shall be 3/16 inches.
- c. Jacketing on equipment shall be smooth.

2. Thickness:

- a. Pipe jacket shall be .016 inches.
- b. Equipment jacket shall be .024 inches.

3. Vapor Barrier:

- a. Continuous lamination to jacket.
- b. One mil polyethylene film with 40 lb. virgin kraft paper.

2.6 FINISH:

- A. Exposed Piping (in equipment rooms and elsewhere throughout the facility) shall be one of the finishes listed below as selected by the contractor unless a type of finish is specifically indicated:

1. (Aluminum) (~~Stainless Steel~~) jacketing.

B. Fittings:

1. Fittings adjacent to ASJ jacket shall be finished with PVC jacket.
2. Fittings adjacent to jacketing other than ASJ shall be finished similar to piping.

2.8 ADDITIONAL INSULATION REQUIREMENTS:

- A. Accessories subject to condensation:

1. This shall include but not be limited to:
 - a. Piping to gauge
 - b. Valve stems

2. Wrap component subject to condensation with self-stick neoprene insulating tape.
- B. Where insulation is specified for piping, insulate similarly all connections, vents, drains, fitting, valves, mechanical couplings, expansion bellows and any appurtenances and piping connected to system subject to heat loss or gain. Unions, couplings, or flanges provided at equipment for removal of heat exchanger, condenser, or evaporator heads shall be insulated with removable molded blocks.

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL:

- A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.
- B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 FIBERGLASS INSULATION SCHEDULE:

- A. Domestic Cold Water Piping:
 1. Up to 1-1/4" pipe - 1/2" thk.
 2. 1 1/2" pipe and larger - 1" thk.
- B. Domestic Hot Water Piping:
 1. Up to 1-1/4" pipe - 1" thk.
 2. 1 1/2" pipe and larger - 1-1/2" thk.

3.3 ELASTOMERIC AND POLYOLEFIN INSULATION SCHEDULE (Only For Piping Located in Wall or Chase):

- A. Domestic Cold Water Piping:
 1. All pipe - 1/2" thk.
- B. Domestic Hot Water Piping (without heat tracing):
 1. All pipe - 1" thk.

PART 4 - EXECUTION

4.1 INSTALLATION:

- A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.
- B. Outward clinching staples shall be used on ASJ jacketing and be sealed with vapor barrier sealer on cold pipe. Piping not easily accessible for repair or maintenance shall be banded with three aluminum bands per section.

- C. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.
- D. Butt joints and seams of elastomeric and polyolefin insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.
- E. Insulation for heat traced pipe shall be sealed with tape or adhesive. Staples shall not be used.

4.2 ANCHORS AND SUPPORTS:

- A. Anchors and supports that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.
- B. Jacketing shall be carried through hanger on inside of 16 gauge sheet metal shields and sealed to maintain continuous vapor barrier except domestic hot water may be insulated around the hanger.
- C. Where inserts occur at pipe supports and guides, provide the following:
 - 1. On hot pipes apply 3" wide vapor barrier tape or band over the butt joints.
 - 2. On cold pipes apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with 3" wide vapor barrier tape or band.

4.3 FITTINGS:

- A. General:
 - 1. Apply vapor barrier to insulation and all seams.
- B. FSK Duct wrap:
 - 1. Apply pressure sensitive vapor barrier tape.

4.4 METALLIC JACKETING:

- A. Jacketing shall be held in place with a friction type, Z lock, or 2" overlap joint. Joints shall be completely sealed along the longitudinal seam and shall be installed to shed water. Circumferential joints shall be sealed by use of 2" wide butt strips. 1/2" bands shall secure jacketing. Space as recommended by the manufacturer.
- B. Straps shall secure jacket. Straps shall be the same material as jacket. Provide 1/2" straps for jackets up to 12" in diameter. Provide 3/4" straps for 14" and larger diameter jackets.

4.5 FIRERATED ASSEMBLIES:

- A. Insulation shall run through firerated assemblies. Where insulation is not approved for routing through fire rated assemblies, transition to an approved fire rated insulation of the same thickness where the insulation is routed through the fire rated assembly. The transition shall occur between a minimum of six (6) inches and a maximum of twelve (12) inches from assembly on both sides of assembly.

4.6 MULTI-LAYER INSTALLATION:

- A. Joints shall be staggered.

END OF SECTION 22 0719

SECTION 22 3300 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of water heaters and appurtenances where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. All equipment shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
 - a. UL Code 174 Safety Standards
 - b. Industrial Risk Insurers - Automatic Single Bond
 - c. NFPA 58
 - d. Kemper
 - e. ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
- B. All pipe, pipe fittings and vessels shall be constructed in accordance with ASME standards.
- C. Manufacturer:
 - 1. The following water heater manufacturers are acceptable.
 - a. A. O. Smith Water Production Company

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Equipment shall meet or exceed scheduled efficiencies or ASHRAE 90.1, whichever is greater.

- B. The water heaters physical dimension shall allow installation in space shown on plans without removal of doors or walls and only minor disassembly of water heater (i.e. removal of energy module).

2.2 CONSTRUCTION:

A. Vessel:

1. The water heater tank shall be constructed in accordance with ASME Code Section IV and UL approved.
2. Water heaters shall bear the UL label.
3. Water heaters shall be factory tested at 150 psi after assembly and be designated for 150 psi working pressure.

B. Lining:

1. Water heaters shall have all internal surfaces exposed to water completely lined with a non-soluble, non-porous glass lined material creating a corrosion resistant barrier over the steel.

C. Insulation:

1. The tank shall be insulated and comply with requirements of ASHRAE 90.1, Addendum 90.1b Standards and local and state energy codes (Minimum R15).

D. Finish:

1. Water heaters shall have the insulation protected by a steel jacket. The jacket shall have a factory applied baked enamel finish.

E. Relief Valve:

1. Provide an ASME temperature and pressure relief valve on all water heaters.

F. Fittings:

1. All fittings directly connected to the water heater shall be cast bronze.

2.3 ELECTRIC WATER HEATER(S):

A. General:

1. Provide electric water heaters with heating elements, built-in protection, controls accessories, and factory wiring so that only power connection and piping is required in the field.
2. Coordinate current and voltage requirements with the electrical contractor.

B. Heating Elements:

1. Heating elements shall have a maximum watt density of 80 watts per square inch at the rated voltage.

C. Controls and Accessories:

1. Electric water heaters:
 - a. Immersion thermostat (minimum of 2).
 - b. Each heating element shall be activated by a fused magnetic contactor.
 - c. Step down transformer for control voltage.
 - d. Internal fusing for each element.
 - e. Temperature limiting device.
 - f. Anode rod.
 - g. Brass drain valve.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Relief lines shall be run full size to a floor drain or service sink.

3.2 INITIAL START-UP:

- A. Water heaters shall be inspected and started by an authorized factory representative.

3.3 WARRANTY:

- A. Water heaters:
 1. Provide a 3 year tank warranty to protect the Owner against defects in material and workmanship, discolored water or tank perforation due to erosion or corrosion.
 2. Should the water heater fail within the first three years following authorized start-up, the manufacturer shall, at their option, repair or replace the water heater at no expense to the Owner.

END OF SECTION 23 3300

SECTION 22 4011 - PLUMBING ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the plumbing system, accessories and appurtenances where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:
2. South Carolina Department of Health & Environmental Control.
3. Plumbing and Drainage Institute Standard No. WH201 "Standard for Water Hammer Arresters."
4. Plumbing and Drainage Institute Standard No. G-101 "Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance."
5. ASSE Standard 1010-2004 "Performance Requirements for Water Hammer Arresters."
6. ASTM C1613 "Standard Specification for Precast Concrete Grease Interceptor Tanks"
7. American Concrete Institute (ACI)

B. Manufacturers:

1. The following floor drain and overflow manufacturers are acceptable:
 - a. Mifab

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- b. J. R. Smith
 - c. Wade
 - d. Josam
 - e. Zurn
 - f. Watts
2. The following floor clean out manufacturers are acceptable:
- a. Mifab
 - b. J. R. Smith
 - c. Wade
 - d. Josam
 - e. Zurn
 - f. Watts
3. The following water hammer arrester manufacturers are acceptable:
- a. Mifab
 - b. J. R. Smith
 - c. Sioux Chief
 - d. Watts
 - e. Zurn
4. The following trap seal primer device manufacturers are acceptable:
- a. Mifab
 - b. Precision Plumbing Products
 - c. Josam
5. The following trap seal protection device manufacturers are acceptable:
- a. SureSeal Manufacturing; Inline Floor Drain Trap Sealer

PART 2 - PRODUCTS

2.1 FLOOR DRAINS (FD-X):

- A. Provide floor drains at locations shown on drawings.
- B. Each drain shall be provided with a cast iron p-trap. Provide full size of drain outlet.
- C. Trap seal primers shall be provided where indicated on drawings.
- D. Vandal proof screw where stated shall be Torx security pin type screw.
- E. Provide membrane clamp (–C) in floor areas with waterproofing membrane.
- F. All strainer tops to be reinforced to prevent cupping.
- G. Outlet connections for floor drains installed at grade level shall be push-on. Contractor's option for outlet connection type for floor drains installed above grade.
- H. Floor drains shall be:
 - FD-1: General Purpose Floor Drains: Mifab Series F1000-C- cast iron drain with 6" round adjustable reinforced stainless steel top with trap seal primer tapping.
 - FD-2: Mechanical Equipment Room Floor Drains: Mifab Series F1340-4-5-7-13-14 cast iron galvanized drain and sediment bucket with 12" round adjustable non-tilt ductile iron tractor grate with trap seal primer tapping.

2.2 CLEANOUTS:

- A. Provide cleanouts at locations shown on plans and at all bends, angles, upper terminals and each one hundred feet of pipe run.
- B. All Cleanouts to have full opening 4" access. Floor cleanouts to be provided with plastic/ABS countersunk regular slotted plugs lubricated with non hardening thread lubricant.
- C. Flush-with-floor cleanout tops shall have non-skid covers.
- D. Flashing flange with device required on membrane floors.
- E. Outlet connections for floor cleanouts installed at grade level shall be push-on. Contractor's option for outlet connection type for floor cleanouts installed above grade.
- F. Cleanouts shall be:
 - 1. Finished Room Floors (Round Top): Mifab Series C1000 -R-3 (round top) cast iron adjustable floor level cleanout assembly with stainless steel top.
 - 2. Unfinished Floors: Mifab Series C1100-XR-4 all cast iron adjustable floor level cleanout assembly with round heavy duty ductile iron top.
 - 3. Yard Areas: Mifab Series C1300-MF w/C1230 cast iron concrete surface level cleanout assembly with lifting device.

4. Aboveground Caulk Ferrule Cleanouts: Mifab Series C1460-RD cast iron ferrule with 6" diameter stainless steel cover. Mifab Series C1460 for plug only.

2.3 VACUUM BREAKERS:

- A. Vacuum breakers shall be constructed as follows:
 1. Body shall be chrome plate brass.
 2. Retainer tube screen, cap and collar shall be stainless steel.
 3. Ball check shall be stainless steel.
 4. Seat shall be resilient "O" ring.
 5. Size shall be line size or as indicated on drawing.
- B. Vacuum breakers shall be installed on all flush valves, service sinks, mop sinks, hose bibbs, wall hydrants, hose reels, threaded hose connections, any devices which can be installed or placed below a fixture flood rim, and elsewhere as specified.
- C. Dishwashers shall be provided with a satin chrome lead free anti-siphon, spill-resistant vacuum breaker. Vacuum Breaker shall be Watts LF008PCQT or equal.

2.4 WATER HAMMER ARRESTERS:

- A. Water hammer arresters shall be installed on both hot and cold water lines.
 1. Size by fixture unit rating of Plumbing and Drainage Institute (PDI).
 2. Select the next larger water hammer arrester when water pressure in line exceeds 65 PSI.
 3. Water hammer arresters shall conform to ASSE 1010-2004.
- B. Water hammer arresters shall be permanently sealed, tested to 5000 cycles and 125 PSI working pressure. Water hammer arrestors shall be suitable for installation in concealed locations without requiring access panels.
- C. Provide a water hammer arrester at the following locations:
 1. Flush valves (water closet/urinal):
 - a. Single fixture.
 - b. When in a battery and up to twenty (20) feet at the end of the branch line between the last two (2) fixtures.
 2. Quick closing valves.
 3. Solenoids.

4. Lavatories:
 - a. When in a battery and up to twenty (20) feet at the end of the branch line.
 5. Risers (at the top).
 6. When fixtures in a battery and exceeds twenty (20) feet, provide an additional water hammer arrester mid point.
- D. Water hammer arresters shall be, or equal to:
1. Mifab MWH Series
 2. J. R. Smith No. 5000 Series Hydrotrol
 3. Sioux Chief No. 650 Series Hydra-Rester
 4. Watts No. 15M2 Series Water Hammer Arrester
 5. Zurn 1700 Series

2.5 TRAP SEAL PROTECTION DEVICES:

- A. Device shall be barrier type configuration and shall be tested and certified to ASSE 1072 Standard "Performance Requirements for Barrier Type Floor Drain Trap Seal Protection Devices".
- B. Body: ABS Plastic
- C. Diaphragm & Sealing Gasket: Neoprene Rubber
- D. Size: 2 inch, 3 inch, 3-1/2 inch, or 4 inch.
- E. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.
- F. Provide at each floor drain or floor sink connection whether or not the floor drain or floor sink is specified with a trap seal primer.

PART 3 - EXECUTION

3.1 TEMPORARY PLUMBING FACILITIES:

- A. Temporary toilet facilities, and water for construction purposes shall be as specified in Division 1 all to be provided by General Contractor. This Contractor shall cooperate to connect building facilities where required by Architect/Engineer to expedite progress of the work.

3.2 FLOOR DRAINS:

- A. All drains above grade shall be flashed with 4 lb. sheet lead clamped under flashing ring extending 18" from drain in all directions, lead shall be mopped to structural deck.

- B. All drains shall be provided with deep seal p-traps.
- C. Set drains to provide drainage of surrounding areas.

3.3 TRAP SEAL PROTECTION DEVICES:

- A. Trap seal protection devices shall be installed at trim out stage of project and not before.

3.4 VACUUM BREAKERS:

- A. Vacuum breaker shall be installed per code and 6" above floor rim, whichever requirement is most stringent.

3.5 WATER HAMMER ARRESTERS:

- A. Water hammer arresters shall be installed in an upright position.

3.6 STERILIZING AND CLEANUP:

- A. After system has been installed completely, Contractor shall clean all fixtures removing all plaster, labels, etc. All water piping shall be sterilized in accordance with these specifications.

3.7 INSPECTIONS, TESTS, AND ADJUSTMENTS:

- A. During progress and after completion of the work included under this specification, Contractor shall make all required tests at his own expense in presence of Architect/Engineer as follows and in accordance with local codes. Contractor shall furnish all testing instruments, gauges, pumps, etc.
- B. All materials shall, so far as possible, be subjected to standard tests by manufacturers before shipment.
- C. All tests shall be conducted in accordance with System Test And Start-Up specification.
- D. Upon completion of work, Contractor shall obtain and turn over to the Architect certificates of inspection and approval from all City and State Authorities having jurisdiction.

END OF SECTION 22 4011

SECTION 22 4100 - PLUMBING FIXTURES (SINKS AND LAVATORIES)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
 - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
 - b. Staple Vitreous China Plumbing Fixtures
 - c. U. S. Department of Commerce CS 20-49, CS 77-48.
 - d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following lavatory manufacturers are acceptable:
 - a. Kohler Company
2. The following manual faucet and handle manufacturers are acceptable:
 - a. Moen
3. The following fixture trim manufacturers are acceptable:
 - a. Kohler Company
 - b. McGuire Manufacturing Company
 - c. Engineered Brass Company (EBC)
 - d. Brass Craft

4. The following handicapped insulation manufacturers for lavatories are acceptable:
 - a. TrueBro
 - b. McGuire Pro-Wrap

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM:

A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. All wall hung fixtures shall have carriers.
4. Provide lavatories with angle stops. Provide all other plumbing fixtures with either angle or straight stops.
5. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
6. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.
7. Color of fixtures shall be white unless specifically noted otherwise.

B. Handicap Sinks and Lavatories:

1. Provide TrueBro Model 102W (White) p-trap, hot water and cold water angle valve insulation and fasteners. Handi Lav-Guard insulation kit. (Provide No. 105W accessory with No. 102 for offset p-trap.)
(Approved Equal: McGuire Pro-Wrap Model PW 2125 (White).)

2.2 LAVATORIES (GENERAL):

- A. Minimum connections shall be 3/8".
- B. Enameled cast iron unless stated otherwise.
- C. Lavatories mounting heights shall be as listed for each fixture:

P-3 Lavatory (Handicapped): Wall hung, 20" x 18", Hudson, mounting height 29" from finish floor to bottom of apron. 8" knee clearance.

Fixture: Kohler, K-2867 (plate anchor) 4" center. Cast iron lavatory.

Fitting: Moen, model 8210, 4" centers faucet with ADA approved lever handles and vandal proof aerator. 0.5 GPM Flow.

Drain: Kohler, K-7715 perforated grate, 1-1/4" tailpiece.

Supply: McGuire model 2165 LK.

P-Trap: McGuire model 8902 - 1-1/2" p-trap.

Remarks: Provide TrueBro lavatory shield with vandal proof screws.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with Manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS:

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights refer to sheet P-001.

3.3 FIXTURE SUPPORTS:

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

- B. Lavatories and sinks mounted on stud walls:
1. Install a 1/4" thick by 6" wide steel plate which shall extend at least one stud beyond the first and last fixture mounting points.
 2. In wood stud construction, the plate shall be securely attached to each stud which it crosses with two (2) 1/2" steel bolts on 4" centers with 1/8" thick by 1-1/2" wide by 6' long steel backup plates.
 3. In steel stud construction the plate shall be attached to each stud which it crosses by 1/8" fillet weld across the full width of the steel stud flange or plate and support carrier J.R. Smith 800.
 4. Fixture or supporting arms shall be securely and firmly attached to the steel plate in accordance with the manufacturer's instructions.
 5. Lavatories shall be punched for Smith No. 723 concealed arm fixture support. The arms shall be securely bolted to the steel backing plate in the wall as hereinbefore specified. They shall have positive mechanical locking device and shall be fully adjustable after installation of the finished wall.

3.4 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.
- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 22 4100

SECTION 22 4300 - PLUMBING FIXTURES (WATER CLOSETS AND URINALS)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
 - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
 - b. Staple Vitreous China Plumbing Fixtures
 - c. U. S. Department of Commerce CS 20-49, CS 77-48.
 - d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following water closet manufacturer is acceptable:
 - a. Kohler Company
2. The following manual flush valve manufacturer is acceptable:
 - a. Moen
3. The following water closet seat manufacturers are acceptable.
 - a. Sperzel Company
 - b. C. F. Church Company

- c. Beneke Corporation
- d. Olsonite Corporation
- e. Bemis
- f. Toto
- g. Kohler
- h. CENTOCO

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM:

A. General:

- 1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
- 2. All enamel on cast iron fixtures shall be acid resisting.
- 3. All wall hung fixtures shall have carriers.
- 4. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
- 5. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.
- 6. Color of fixtures shall be white unless specifically noted otherwise.

2.2 WATER CLOSETS:

- A. Minimum connection shall be 1 inch.
- B. Seat shall be white unless stated otherwise.
- C. Handicapped water closet locate flush valve handle on the wide side of fixture.
- D. Secure all flush valves to wall with wall bracket.
- E. Water closets shall be:

P-1 Water Closet (Handicapped): Floor mounted, 16-5/8" finish floor to top of rim.

Fixture: Kohler, Highcliff model K-96057 elongated toilet, 1.6 GPF.

Valve: Moen model 8310M16 polished chrome, 1-1/2" manual 1.6 GPF flush valve.

Seat: Beneke, 527 SS (White).

Bolt Caps: Supplied with water closet.

Remarks: wall bracket shall be Sloan model J-212A or J-312A or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS:

A. General:

- B. Mount fixtures as shown on for each fixture type on sheet P0.01.

3.3 WATER CLOSETS:

- A. Make joints between earthenware fixtures and soil pipe by means of flange compatible to pipe. Joint shall be gastight and watertight.
- B. Set all floor type water closets with a "no-step" sleeve gasket as manufactured by William H. Harvey Company.

3.4 FIXTURE SUPPORTS:

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the

load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

3.5 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.
- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 22 4300

SECTION 23 0501 - GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. The Heating, Ventilation, and Air Conditioning (HVAC) work shall include, but not be limited to, the following:
 - 1. Heating systems
 - 2. Air Conditioning
 - 3. Air Distribution
 - 4. Controls and Instrumentation
 - 5. Balancing of Air Systems

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.
- B. All sections of Division 23 Specifications apply to this section.

1.3 DELINEATION OF WORK:

- A. Provide all necessary coordination of information to installers who are performing work to accommodate Division 23 installations.
- B. Where the Division 23 installer is required to install items which they do not purchase, they shall include for such items:
 - 1. The coordination of their delivery.
 - 2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
 - 3. Their safe handling and field storage up to the time of permanent placement in the project.
 - 4. The correction of any damage, defacement or corrosion to which they may have been subjected.
 - 5. Their field assembly and internal connection as may be necessary for their proper operation.

- 6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
- 7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
- C. Items which are to be installed by the Division 23 installer but not purchased as part of the work of Division 23 shall be carefully examined upon delivery to the project. The Division 23 installer shall provide all work necessary to properly install these items.
- D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the A/E shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the A/E.

1.4 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.
- B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- C. All equipment of one type (such as fans, grilles, etc.) shall be the products of one manufacturer unless specifically stated otherwise.
- D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
- E. All materials with a manufacturers listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.

- B. Where Codes and Standards are referenced, they shall be the date stated in these specifications or on the drawings. If none stated, they shall be the latest edition.
- C. All work shall conform to the following Building Codes:
 - 1. International Building Codes
 - 2. National Fire Protection Association
- D. All work shall conform to all federal, state, and local ordinances.
- E. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:
 - 1. Factory Mutual Laboratories (FM)
 - 2. Underwriters Laboratories, Inc. (UL)

1.6 STANDARDS AND PROCEDURES

- A. All work shall meet or exceed the standards and procedures of the following:
 - 1. ADC: Air Diffusion Council
 - 2. AMCA: Air Moving and Conditioning Association, Inc.
 - 3. ANSI: American National Standards Institute
 - 4. ARI: American Refrigeration Institute
 - 5. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
 - 6. ASME: American Society of Mechanical Engineers
 - 7. ASTM: American Society of Testing and Materials
 - 8. MSS: Manufacturers Standardization Society
 - 9. NEMA: National Electrical Manufacturer's Association
 - 10. OSHA: Occupational Safety & Health Administration
 - 11. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
 - 12. IRM: Improved Risk Mutuals

1.7 APPROVAL OF SUBSTITUTIONS:

- A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the

words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the A/E shall be final and bind all parties concerned.

- B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to bid opening date to the A/E. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.
- C. Approval of the A/E to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.
- D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the A/E, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS:

- A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.
- B. Notify the A/E of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.9 EQUIPMENT CONNECTIONS:

- A. The contract documents may indicate specific electrical, duct, and piping connection locations to equipment. Each manufacturer approved for bidding may have different connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.
- B. The Contractor shall bear all costs for required changes in connection to equipment.

1.10 WORKMANSHIP:

- A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.
- B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on job site and submit others for approval when required.

1.11 GUARANTEES AND WARRANTIES:

- A. General:
 - 1. Furnish to the A/E a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
 - 2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.
- B. Equipment Warranties:
 - 1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at their option, may permit the contractor to provide the required repairs on the equipment unless specified otherwise.
 - 2. The equipment manufacturer shall include a written guarantee with the closeout documentation.
- C. Duration Period:
 - 1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
 - 2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.
- D. Extended Warranties:
 - 1. Warranty periods shall be extended where specifically stated in these specifications.
 - 2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
 - 3. The extended warranty time listed is time in addition to the base warranty period.
 - 4. The following systems or equipment shall be extended warranties:

- a. The building automation system shall have a one year extended warranty.
 - b. All air conditioning compressors shall be provided with an extended 4-year warranty, including parts and delivery charges. Centrifugal and rotary compressors shall include motor, impeller or screw, and drive train.
- E. Non-Warranted Items:
 - 1. Non durable replaceable items such as air filter media do not require replacement after the date of acceptance.
- F. Warranty Repair:
 - 1. Repair shall take place as soon as possible but not later than the following:
 - a. Items not essential for facility operation - 7 days.
 - b. Items that have a small impact on facility operation - 2 days.
 - c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.
 - 2. The determination of the impact on the facility is solely that of the Owner and A/E.
 - 3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
 - 4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
 - 5. All costs associated with warranty work shall be borne by the contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRIOR CONDITIONS:

- A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.
- B. If the prior work does not make a proper installation of any equipment or system component possible, notify the A/E prior to installation of any equipment or system component.

3.2 INSTALLATION:

- A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.
- B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the A/E in writing prior to installation of equipment.
- C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the A/E in writing prior to installation of the system component.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT:

- A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the A/E, at no cost to the Owner.
- B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.
- C. Piping shall be protected by storing it on elevated supports and capping the ends.
- D. During construction, all open ends of pipe, etc. which could collect construction debris shall be properly capped.

3.4 CLEANING OF SYSTEMS AND EQUIPMENT:

- A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.
- B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.
- C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.

3.5 SUPPORT OF SYSTEMS:

- A. Hanging duct, piping, or equipment from un-reinforced metal roof decks (i.e., metal roof deck w/o concrete) is not permitted.
- B. The following methods of support are not permitted:
 - 1. Wire hangers unless specifically indicated
 - 2. Perforated straps
 - 3. Vinyl or plastic straps

END OF SECTION 23 0501

SECTION 23 0502 - COMMON HVAC MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the mechanical systems where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 23 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
 1. AISC Steel Handbook
- B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.
- C. Manufacturers:
 1. The following caulking manufacturers are acceptable:
 - a. TREMCO
 - b. Sonneborn - Contech
 - c. W. R. Meadows

PART 2 - PRODUCTS

2.1 PRODUCT REFERENCES:

- A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment.
 1. Filters shall be provided on all air systems to protect heat transfer components from outside air, building exhaust air or other airstreams that could foul heat transfer surfaces and elsewhere as indicated. Refer to Particulate Air Filtration specification.

2.2 FLASHING:

A. General:

1. Provide flashing and counter flashing on all pipes, ducts, conduits, and other mechanical system components which penetrate exterior walls.
2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. HVAC Pipe and Conduit:

1. See detail on plans.

2.3 HOUSEKEEPING PADS:

A. General:

1. Housekeeping pads shall be constructed of concrete and shall meet the requirements of the Concrete specifications.
2. Concrete shall develop a minimum strength 3000 psi at 28 days or as specified in the concrete specification, whichever requirement is greater.
3. Housekeeping pads shall extend eight inches past equipment and supports in all direction.

B. Pads (exterior):

1. All equipment installed on grade and on the exterior of buildings shall be provided with a reinforced concrete housekeeping pad.
2. Pad shall be minimum six inches thick and four inches above finished grade.

2.4 DRAINS:

A. General:

1. Drain shall be full size of connections, size indicated on drawings, or 3/4" minimum, whichever is largest.

B. Equipment and Miscellaneous Drains:

1. Provide drains with deep seal p-trap for all equipment provided with drain connections, where drain connections are indicated on the drawings, and when drains required for proper operation of a system.

2.5 DRAIN PANS:

A. Auxiliary Drain Pans:

1. All equipment with condensing coils not located in mechanical rooms with floor drains shall be provided with auxiliary drain pans.

B. Drain Pans (Over Electrical Equipment):

1. Provide 20 gauge galvanized drain pan with drain connection under all pipe located within three feet horizontally of any electrical panels, switchboards, or transformers.
2. Drain pan shall have soldered or welded corners and shall be 2" deep and extend 12" past pipe and 36" beyond electrical equipment.

2.6 EQUIPMENT AND MISCELLANEOUS OVERFLOWS:

- A. Provide overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.
- B. Overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.7 FASTENERS, ANCHORS, AND ACCESSORIES:

- A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic and manufactured in the United States.
- B. Materials provided shall be considered industry standard for commercial or industrial use.
- C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.
- D. Unless otherwise specified or required by the manufacturer, bolts shall meet or exceed the following strengths:
 1. Proof Load: 74 ksi
 2. Yield Strength: 81 ksi
 3. Tensile Strength: 105 ksi

2.8 SEALANT:

- A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.

- B. Color shall be approved by A/E.

PART 3 - EXECUTION

3.1 EQUIPMENT STORAGE:

- A. Facilities for storing materials and equipment shall be provided by the Contractor.
- B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.
- C. All stored items shall be elevated off slab or grade.

3.2 HOUSEKEEPING PADS:

- A. All exposed surfaces shall be steel troweled smooth with beveled edges.
- B. Pad shall be level within 1/16 inch for the length and width of the pad.
- C. Provide all required foundation bolts, washers, sleeves, plates, templates, etc., for mechanical equipment. Foundation bolts shall be embedded in concrete, set in place before concrete is poured and securely held in place with templates.
- D. Furnish shop drawings showing all required hanger bolts and other appurtenances necessary for the proper installation of this equipment. All such work shall be shown in detail on the shop drawings, showing the complete details of all foundations including necessary concrete and steel work, fasteners and vibration isolation devices.
- E. Set all equipment on their foundations and shim level with steel shims and grout up under base for uniform bearing.
- F. Equipment shall be fastened to housekeeping pads as required by seismic design.
- G. Housekeeping pad shall be anchored to the structural slab as required by seismic design or as indicated by structural or mechanical details, whichever requirement is greater.

3.3 DRAINS AND DRAIN PANS:

- A. General:
 - 1. All horizontal gravity drain piping shall be installed with a uniform grade of not less than 1/8" per foot of fall in direction of flow except as noted otherwise.
- B. Equipment and Miscellaneous Drains:
 - 1. Run drain to grade if not indicated otherwise on plans.

3.4 EQUIPMENT AND MISCELLANEOUS OVERFLOWS:

- A. Run overflows to location indicated on plans or, if none indicated, to a location where they can discharge safely without presenting a hazard to personnel. Terminate with appropriate fitting.
- B. Run overflow similar to drain.

3.5 EQUIPMENT PENETRATIONS:

- A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.6 EQUIPMENT INSTALLATION:

- A. Repair all insulation damaged during installation of equipment.

3.7 EQUIPMENT ATTACHMENT:

- A. Equipment shall be secured to the building or structure. Where equipment is provided with a method of attachment, that method shall be used to attach the equipment. Where equipment is not provided with a method of attachment, the contractor shall add gussets, angles, or similar material to the unit without affecting the performance or warranty of the equipment, which shall be used to attach the equipment.

END OF SECTION 23 0502

SECTION 23 0700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all mechanical equipment, piping, ductwork, and appurtenances where shown on the drawings and specified hereinafter under applicable sections of this specification.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0713 - Duct Insulation
 2. Section 23 0716 - HVAC Equipment Insulation
 3. Section 23 0719 - HVAC Piping Insulation

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All insulation materials must have a maximum 25/50 flame/smoke rating as tested by ASTM E-84, NFPA 255 and UL 723 except where specifically noted otherwise.
2. OSHA
3. Flame/smoke rating shall be minimum 25/250 in equipment rooms where the room is not used as a plenum.

- B. Insulation thickness shall equal those recommended by ASHRAE 90.1 or as scheduled, whichever is greater. Surface temperatures shall be below 140 degrees F.

- C. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above.

- D. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facing to impart flame and smoke safety shall be permanent. The use of water soluble treatments is prohibited.

- E. Installation and materials shall meet the requirements of the International Building Codes.
- F. All insulation work shall be applied by mechanics normally employed in the trade. All insulation shall be installed in accordance with the manufacturer's recommendations.
- G. All insulation furnished under this Division of the specifications shall be the product of one manufacturer except for special applications.
- H. Manufacturers:
 - 1. The following manufacturers of sealants, adhesives, and mastics shall be:
 - a. Foster

PART 2 – PRODUCTS

2.1 MASTICS, SEALANTS, AND ADHESIVES:

- A. General:
 - 1. Materials shall be as recommended by the insulation manufacturer.
 - 2. Products shall be applied as recommended by the manufacturer for that specific application.
 - 3. The number of coats and thicknesses shall meet or exceed the manufacturer's recommendation or as indicated in these specifications or on the plans, whichever is greatest (coats and thickness).
 - 4. Materials shall meet LEED requirements for low emitting products.

PART 3 - EXECUTION

3.1 GENERAL:

- A. All insulation materials shall be delivered and stored in manufacturer's container and kept free from dirt, water, chemical and mechanical damage.
- B. Insulation shall be applied by experienced workmen in a workmanlike manner.
- C. Insulation shall not be applied until all pressure testing has been completed, inspected and released for insulation application.
- D. Surfaces to be insulated shall be clean and dry.
- E. All insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.
- F. Insulation shall be run continuously through walls, ceiling openings, and sleeves.
- G. Items that are factory insulated shall not receive additional insulation where not otherwise specified.

3.2 INSTALLATION:

A. General:

1. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal.

END OF SECTION 23 0700

SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including valves, mechanical couplings, fittings, flanges, strainers, expansion joints, and appurtenances where shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0700 - HVAC Insulation

1.3 QUALITY ASSURANCE:

A. Manufacturers:

1. The following fiberglass piping insulation manufacturers are acceptable:
 - a. Owens/Corning
 - b. Knauf
 - c. Johns Manville
2. The following elastomeric pipe insulation manufacturers are acceptable:
 - a. Armacell
 - b. K-Flex

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.
- B. Insulation outside shall have a maximum 25/450 flame/smoke rating. Insulation in all other locations shall have a maximum 25/50 flame/smoke rating.

2.2 TYPES OF INSULATION:

A. Fiberglass Insulation:

1. Physical properties:
 - a. Thermal conductivity (k) is .25 at 100 degrees F.
2. Jacket:
 - a. ASJ jacket with or without self-sealing adhesive system
3. Insulation shall be:
 - a. Owens/Corning Heavy Density Fiberglass Insulation ASJ/SSL or ASJ

B. Elastomeric Insulation:

1. General:
 - a. The insulation shall have a factory applied adhesive closure system.
2. Physical properties:
 - a. Thermal conductivity (k) is .27 at 75 degrees F.
 - b. Water transmission is .08 perms – inch.
 - c. Will not significantly contribute to fire.
3. Insulation shall be:
 - a. Armacell type AP Armaflex or type AP/SS

2.3 PIPE INSULATION APPLICATION:

A. General:

1. All fittings and accessories in the piping system shall be insulated similar to the piping system.

B. Fiberglass Pipe Insulation:

1. Fiberglass pipe insulation is required for all piping systems required to be insulated except where other types of pipe insulation are specified.

C. Elastomeric Pipe Insulation:

1. Elastomeric pipe insulation not permitted on the following:
 - a. Where details or notes specifically require another insulation type.

2. Elastomeric pipe insulation may be provided at contractors option (except where not permitted above) for the following systems in lieu of fiberglass insulation.
 - a. All piping indicated on the Elastomeric Insulation Schedule or, if none provided, on pipe where 1/2" or 3/4" fiberglass insulation required.

2.4 FITTINGS:

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Fiberglass Pipe Insulation:

1. Piping (up to 1-1/4"):
 - a. Fittings may be mitered at contractor's option.

C. Elastomeric Pipe Insulation:

1. Piping (up to 3/4"):
 - a. Fittings may be mitered at contractor's option.

2.5 PIPE INSERT (FOR ELASTOMERIC INSULATION):

A. General:

1. Insert shall be a closed cell, high compressive strength, foam insulating pipe support.
2. The insert shall be lined with a closed cell EPDM foam rubber and encased in a zero perm weatherproof membrane.

B. Properties:

Compressive Strength (at yield)	314 PSI
Thermal Conductivity	.312K
Water Absorption (by weight)	<7%
Water Vapor Permeability	0.0 Perm

C. Insert shall be sized for the pipe on which it is installed and the thickness of the adjacent insulation.

D. Manufacturer shall be:

1. Aerofix-U

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL:

- A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.
- B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 FIBERGLASS INSULATION SCHEDULE:

- A. Condensate Drains (not outdoors):
 - 1. All pipe - 3/4" thk.

3.3 ELASTOMERIC INSULATION SCHEDULE:

- A. Refrigerant Suction Lines and Liquid Lines:
 - 1. All pipe - 1" thk.
- B. Condensate Drains (not outdoors):
 - 1. Up to 2" pipe – 3/4" thk.

PART 4 - EXECUTION

4.1 INSTALLATION:

- A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.
- B. Outward clinching staples shall be used on ASJ jacketing and be sealed with vapor barrier sealer on cold pipe. Piping not easily accessible for repair or maintenance shall be banded with three aluminum bands per section.
- C. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.
- D. Butt joints and seams of elastomeric insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.

4.2 ANCHORS AND SUPPORTS:

- A. Anchors and supports that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.

- B. Jacketing shall be carried through hanger on inside of 16 gauge sheet metal shields and sealed to maintain continuous vapor barrier.
- C. Where inserts occur at pipe supports and guides, provide the following:
 - 1. On cold pipes apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with 3" wide vapor barrier tape or band.

4.3 FITTINGS:

- A. General:
 - 1. Apply vapor barrier to insulation and all seams.
- B. FSK Ductwrap:
 - 1. Apply pressure sensitive vapor barrier tape.

4.4 ELASTOMERIC INSULATION:

- A. Inserts:
 - 1. Center insert on hanger or pipe support.
 - 2. Insert shall be installed using the insert manufacturer's adhesive to seal the insert to the adjacent pipe insulation.
 - 3. The insert and adjacent insulation shall be wrapped with the insert manufacturer's tape to seal and finish the installation. The tape shall wrap the insulation/insert two complete times.
- B. Coatings:
 - 1. When installed outdoors without a metallic jacket, the insulation shall be coating with a UV resistant coating.
 - 2. The coating shall provide a minimum of 5 years protection against deterioration.
- C. Tape:
 - 1. 3/4 " longitudinal tape specifically listed for use on elastomeric insulation, shall be installed along every longitudinal seam/joint.

END OF SECTION 23 0719

SECTION 23 0900 - INSTRUMENTATION AND CONTROLS FOR HVAC (GENERAL)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the building environmental controls shown on the drawings and specified hereinafter.

B. Description:

1. Control and instrumentation work shall include:
 - a. Temperature control
 - b. Humidity control
 - c. Airflow control
 - d. Equipment interlock and controls
 - e. Wiring for automatic controls

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0900.01 - Controls for HVAC (Dampers and Valves)
 2. Section 23 0904 - Building Automation System

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:
 - a. Underwriters Laboratories
 - b. NEMA Standards
 - c. National Electric Code

- d. Scientific Apparatus Makers Associates Standard PMC 20.1 for Process Measurement and Control Terminology
 - e. Scientific Apparatus Makers Associates Standard PMC 20.2 for Process Control Performance
 - f. NFPA 90A
- B. Control circuit wiring shall meet NFPA Standard 70, Article 725, for remote control, low energy power, low voltage power and signal circuits.
- C. The building environmental controls shall be provided by the Building Environmental Controls Contractor.
- D. The Building Environmental Controls system shall be installed by competent controls mechanics who are full time employees of the Building Environmental Controls Contractor.
- E. The Environmental Control Contractor shall be responsible for the quality and satisfactory operation of the devices within the system and for the overall performance of the specified air flow control system.
- F. All control equipment shall be the product of one manufacturer whenever practical.
- G. Manufacturers:
 - 1. The following Building Environmental Controls Contractors are acceptable:
 - a. Schreider Electric
 - b. Studdebaker Controls
 - c. Facilitech
 - d. Mechanical Contractors Inc.
 - e. ECS (Engineered Control Solutions)

PART 2 - PRODUCTS

2.1 SYSTEM:

- A. Provide all thermostats, humidistats, sensors, transmitters, controllers, actuators, control panels, conduit, wiring, accessories and appurtenances for a complete building environmental control system.
- B. Provide switches, fuses, disconnects and all other devices necessary for protection and convenient operation of system.

- C. The contractor shall be responsible for providing power wiring, conduit, breakers and final connections for the following equipment and components unless specifically shown on electrical plans:

- 1. Control devices
- 2. Motorized dampers

- D. The control system shall be on normal power.

2.2 CONDUIT:

- A. General:

- 1. All control conduit shall be furnished and installed under this division except where specifically indicated otherwise.
- 2. All line voltage and control wiring in new construction shall be run in conduit.
- 3. Conduit shall be provided in accordance with the Electrical Division of this specification unless noted otherwise in these specifications.
- 4. Outdoor conduit shall be GRC or IMC.
- 5. Indoor conduit may be EMT.

2.3 CONTROLS WIRING:

- A. Wiring for low voltage circuits generally shall be No. 18B and S gauge or larger RSH-2 heat resistant.
- B. Cables of two or more conductors, not smaller than 22 B and S gauge if shielded or No. 18 B and S gauge if not shielded, may be used for low voltage d-c and electronic circuits carrying less than 1.50 amperes, in lieu of individual wires.
- C. Cables carrying a-c circuits sensitive to external fields shall be shielded.
- D. Cables having fewer than 12 conductors shall have thermoplastic or rubber insulation for 300 volts or more and a heavy outer braid or thermoplastic sheath. Shields shall be grounded to building's grounding system, using wire not smaller than No. 14 B and S gage. Shields shall not be grounded to conduit systems or building piping.
- E. Cables shall terminate in solder or screw type terminal strips. All terminal strips shall be numbered.
- F. Cables shall not be tapped at intermediate points.
- G. All wires, whether individual or in cables, shall be color coded and numbered for identification in accordance with the National Electric Code.
- H. Where wire is not in conduit, wire shall be plenum rated.

2.4 TRANSFORMERS:

- A. Transformers shall be furnished and installed for supplying current to control equipment as required.
- B. Transformers shall conform to NEMA standards, shall be capable of supplying 125 percent the connected load, shall be enclosed in U.L. listed cabinets, ventilated, with conduit connections, and provided with fused disconnect switches on primary side and on secondary side.

2.5 CONTROL VOLTAGE:

- A. Voltage shall not exceed 120 volts where located within occupied spaces and not integral with the equipment (such as a unit mounted thermostat).
- B. Voltage in wet or damp locations shall not exceed 24V.

2.6 SPEED SWITCHES:

- A. Speed switches, rheostats, and other fan speed control devices may be furnished by either the equipment manufacturer or the controls contractor.

2.7 DDC THERMOSTATS:

- A. General:
 - 1. Provide electronic thermostat with sensor, night setback, night override switch, and digital setpoint adjustment. The digital setpoint adjustment only shall be visible through cover. Override switch duration and setpoint adjustment range shall be programmable from the front end.
 - 2. Thermostats shall connect to unit controller via communication cable with a standard jack. The thermostat shall also have a connection available for field monitoring.
 - 3. Devices installed in duct system shall be specifically designed for duct systems.
- B. Construction:
 - 1. Device shall be polymer construction.
 - 2. Circuit boards shall be coated.
- C. Technical Specifications:
 - 1. Ambient Operating Conditions: 32 deg F to 140 deg F, 0 to 100% RH
 - 2. Accuracy: $\pm .34$ deg F @ 70 deg F (thru film nickel)

2.8 DDC HUMIDISTAT:

A. General:

1. Provide electronic humidistat without setpoint adjustment.
2. Humidistat shall connect to unit controller via communication cable with a standard jack. The humidistat shall also have a connection available for field monitoring.
3. Devices installed in duct system shall be specifically designed for duct system.
4. Where humidistat and thermostat are located adjacent to each other, at the contractor's option, a combination humidity transmitter and temperature sensor may be provided.

B. Construction:

1. Devices shall be polymer construction.
2. Circuit boards shall be coated.

C. Technical Specification (@ 77 deg F):

1. Ambient operating conditions: 32 deg F to 140 deg F, 0 to 100% RH
2. Accuracy: $\pm 3\%$ RH for 20-80% RH
 $\pm 5\%$ RH for 5-20% and 80-95% RH
3. Temperature Coefficient: .12% RH/deg F
4. Response: less than 120 sec between 50-90% RH
5. Offset Adjustment: ± 5

2.9 SENSORS, TRANSMITTERS, AND OTHER CONTROL DEVICES:

A. General:

1. Provide the type device specified for the specific application. Where the device is not specifically indicated, provide the device best suited to provide the control specified.

B. Location of device:

1. Device shall be located as indicated on the drawings or as stated in the specifications.
2. Where no device location is indicated or specified, the device shall be located as recommended by the manufacturers to provide the best practical results.

3. Where the location indicated on the drawings or stated in the specifications does not provide the best practical results, the manufacturers shall provide recommendations for relocating the device.
4. It shall be the responsibility of the contractor to identify all conflicts between indicated device locations and manufacturers recommended locations prior to installation of any related components (i.e., sensor wells, conduit, etc.).

2.10 SAFETY DEVICES:

A. General:

1. Safety devices including, but not limited to, the following shall be hard wired to perform their required function. Status, where specified, shall be monitored by the building automation controls system and initiate other sequences where required:
 - a. Condensate overflow switch

2.11 CONTROL PANELS:

A. General:

1. All controllers, relays, switches, etc., for equipment shall be mounted in enclosed control panels with key lockable, piano hinged door.
2. Location of each panel shall be where indicated on plans, approved by A/E, and convenient for adjustment and service.
3. Label each panel properly identifying function or service of panel and all surface mounted devices.
4. Control panels shall be extruded or formed, cold-rolled steel, enamel surfaced, with full length mounting brackets, drilled wall mounting holes.
5. The control panel shall be key lockable.
6. Provide a 24V control transformer.

2.12 FLOAT SWITCH:

A. General:

1. Float switch shall include a sealed, waterproof reed/magnet float switch with no exposed electrical contacts.
2. Float shall be prewired with 6 ft. long, 18 ga. lead cables.
3. Switch shall be tested to UL 508 and UL listed for 24V AC.
4. Float shall attach to drain pan with stainless steel clips.

B. Locations:

1. All drain pans.

C. Manufacturers shall be:

1. SMD Research Safe-T-Switch Model SS3.

2.13 EQUIPMENT STATUS:

- A. Equipment status shall be provided by solid state current sensors.
- B. Sensor shall have non-polarity sensitive outputs, trip point adjustment, trip LED, and power LED.

2.14 THREE PHASE VOLTAGE MONITOR:

- A. Monitor shall be autoranging type that detects single phasing, low voltage, phase reversal or voltage unbalance. When a harmful condition exists, the output relay shall deactivate. When the harmful condition is removed, the relay shall reactivate.
- B. The three phase voltage monitor shall be field or factory installed on all three phase equipment.
- C. If three phase protection is already provided with the equipment via the VFD or other means, the control contractor does not have to provide additional three phase protection.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

1. The Building Environmental Controls Contractor shall be responsible for a complete operational system.
2. The installation shall include:
 - a. Drawings
 - b. Supervision
 - c. Interlocks
 - d. Adjustments
 - e. Verification
3. Location of sensing elements shall be the responsibility of the installer.

- B. Wiring splices shall not be permitted in electrical panelboards, junction boxes and switchgear.

3.2 THERMOSTATS, HUMIDISTATS AND SWITCHES:

A. General:

1. Install all devices as recommended by manufacturer.
2. When device is provided by the control contractor, the control contractor shall be totally responsible for all coordination with the equipment supplier to ensure compatibility of components to meet the requirements of the equipment manufacturer and the control sequence.

B. Installation:

1. Mount thermostats, sensors, and switches 4'-0" above finished floor to the top of the device's control mechanism unless noted otherwise.
2. Mount humidity sensors 7'-0" above finished floor unless noted otherwise.
3. Thermostats mounted on exterior walls shall be mounted on a thermally insulated sub-base.
4. When location is not shown, Contractor shall assume the most remote location served by unit. Coordinate exact location with A/E.
5. Contractor shall coordinate location of thermostat, humidistats, and switches with final architectural plans and actual field conditions to avoid locating them inside cabinets, bookcases, casework, tackboards and behind door swings and similar obstructions that would limit access or limit the ability to properly sense space conditions.

3.3 WIRING:

- A. All control wiring within starters (and motor control centers) shall be installed in a workmanlike manner and neatly laced.
- B. All wiring installed in manholes, below grade, or below ground water level shall be made up with waterproof connections.
- C. Wiring in manholes shall be continuous thru manholes.

3.4 CONDUIT:

- A. Conduit sleeves thru non-waterproofed walls and floors shall be grouted and caulked on both sides of wall.
- B. After installation, any painted pipe which is damaged shall be touch-up painted.

3.5 DEVICES ON EXTERNALLY INSULATED DUCTS:

- A. Devices mounted on externally insulated ducts shall be mounted on standoff brackets to allow proper installation of duct. If device must be mounted directly to duct for proper operation, standoff bracket may be deleted.

3.6 SPEED SWITCHES:

- A. If switch is not factory installed on the unit, the control contractor shall field install the switch.

3.7 FLOAT SWITCH:

- A. Secure bracket to drain pan with screw.
- B. Verify float is properly positioned.

END OF SECTION 23 0900

SECTION 23 0900.01 - CONTROLS FOR HVAC (DAMPERS AND VALVES)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the damper and valve controls shown on the drawings and specified hereinafter.

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.

B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0900 – Instrumentation and Controls for HVAC (General)

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:

- a. Underwriters Laboratories
- b. NEMA Standards
- c. National Electric Code
- d. Scientific Apparatus Makers Associates Standard PMC 20.1 for Process Measurement and Control Terminology
- e. Scientific Apparatus Makers Associates Standard PMC 20.2 for Process Control Performance
- f. NFPA 90A

B. All control equipment shall be the product of one manufacturer whenever practical.

C. Manufacturers:

1. The following damper actuator manufacturers are acceptable:

- a. Belimo
- b. Honeywell

- c. Siemens

PART 2 - PRODUCTS

2.1 DAMPER ACTUATORS:

- A. Provide damper actuators for control of motorized dampers where shown on plans, schedules, or specified.
- B. Damper actuators shall be selected by the control contractor and shall be sized to fully open and close against the rated duct static pressure.
- C. The operator linkage arrangement shall permit travel of the actuator from full open to full close without any binding.
- D. Loss of power:
 - 1. Dampers shall fail as required by sequence of operation or as required by Code.
 - 2. For all dampers not indicated, dampers shall fail (i.e., position damper returns to without power) as follows:
 - a. Outside air dampers: closed
- E. Proportional actuators shall be provided for:
 - 1. Outside air dampers specified for a specific CFM
 - 2. Where required to be proportional by the system Sequence of Operation
 - 3. All others not listed as two position
- F. Unless otherwise indicated, actuators shall be:
 - 1. Dampers requiring proportional control - electronic.

PART 3 - EXECUTION

3.1 DAMPER ACTUATORS:

- A. Submittals shall indicate force on damper and actuator capacity.

END OF SECTION 23 0900.01

SECTION 23 0993.2 - SEQUENCE OF OPERATION (AIR HANDLING EQUIPMENT)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0993 - Sequence of Operation for HVAC Controls and Points List

PART 2 - SEQUENCE OF OPERATION

2.1 EXHAUST AND SUPPLY FANS:

- A. Fans shall be controlled as shown on the schedule.
- B. Fans under timed control shall be off during unoccupied mode except in override mode.
- C. Provide auxiliary contacts for start/stop for all fans not temperature controlled.
- D. A motorized damper associated with a fan shall open when fan is energized.

END OF SECTION 23 0993.2

SECTION 23 0904.02 - BUILDING AUTOMATION SYSTEM (LON SYSTEMS)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the building automation system shown on the drawings and specified hereinafter.

B. Description:

1. The work shall include, but not be limited to, the following:
 - a. Field programmable digital system controller(s).
 - b. Field programming to perform monitoring and control functions specified herein and on point schedule.
2. All sensors, actuators, transducers, solenoids, transformers, wiring and appurtenances shall be provided for a complete building automation system.
3. Digital controller shall include the distributed microprocessors.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0900 - Instrumentation and Controls for HVAC (General)

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment and components shall comply with all local codes and ordinances, and meet or exceed the following standards:
 - a. American Society for Testing and Materials ASTM
 - b. Institute of Electrical and Electronic Engineers IEEE
 - c. National Electrical Manufacturers Association NEMA
 - d. Underwriters Laboratory, UL (UL 916
 - e. FCC Regulation, Part 15, Section 156

- f. National Fire Protection Association NFPA
- B. All equipment shall have the UL label.
- C. Products:
 - 1. Comply with LonMark™ Interoperability Association, Interoperability Guidelines for all products. Utilize published functional profiles for all product network message and configuration parameters. Where published profiles do not exist, utilize draft profile standards or submit a proposed draft as part of the submittals required in Article 1.6. All drafts shall also be submitted simultaneously to the LonMark™ Interoperability Association and a copy of such transmittal submitted to the Architect.
 - 2. Utilize standard PC components for all assemblies. Custom hardware, operating system, and utility software are not acceptable.
 - 3. All products (CU's and ID's) shall conform to the Interoperability requirements outlined in the LonMark™ Interoperability Association Guidelines. All products shall be certified to be LonMark™ compliant prior to delivery of submittals to the Architect for review.
 - 4. Utilize Standard Configuration Parameter Types (SCPT's) for all product configuration parameters. Do not use network variables for this purpose.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. The building automation system shall be a microprocessor web based control system specifically designed to provide control of equipment, manage energy and support a preventative maintenance program.
- B. The system shall be configured to function with electronic/electric systems.
- C. The control algorithm shall be proportional and integral. Derivative functions are required where stability of the controller is not likely with PI algorithms.
- D. A control panel used to control equipment on a floor shall typically not be used to control equipment on any other floor (i.e., Panel for terminal units for second floor terminal units shall not be used to control third floor terminal units.)
- E. The new controls system shall incorporate Vykon JACES. Contractor shall only use JACES with an open license.

2.2 CONTROL UNIT (CU):

- A. General Requirements:
 - 1. Control Units shall be equipped with a 3150 Neuron microprocessor controller, a minimum of 64K programmable non-volatile (flash or EEPROM) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.
3. The CU unit shall be equipped with a dedicated software clock battery. The battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a 2-week period. Include an integral calendar with automatic leap year compensation.
4. CU packaging shall be such that complete installation and check-out of field wiring can be performed prior to the installation of electronic boards. Make all board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. The complete CU including accessory devices such as relay, transducers, power supplies, etc., shall be factory-mounted, wired and housed in a NEMA 1 enclosure or as required by the location and local code requirements.
5. Provide CU boards with (1) RJ-11 ports to provide a communication link to the Operators Interface Terminal (OIT). Attachment of the OIT or activation of the panel-mounted operator's terminal shall not interrupt or disable normal operation or communications with the local operations network or field hardware equipment.
6. Equip CU's with diagnostic indicators for the following:
 - a. Transmit
 - b. Receive
 - c. Power up test
 - d. Power up fail
 - e. Power up test okay
 - f. Bus error

B. Input/Output Requirements:

1. The Input/Output (I/O) module back plane shall be designed to accept Inputs or Outputs in any combination and be modified to accept phased additions or changes to the panel point configuration.
2. At least 50% of the CU Inputs shall be Universal type capable of handling current, voltage, resistance, or open and closed contacts in any mix. Analog current and voltage inputs of the following types shall be supported in the CU.
 - a. 4-20 mA
 - b. 0-100 mA
 - c. 0-1 volt
 - d. 0-5 volt

- e. 0-10 volt
- f. 2-10 volt
- 3. Each digital output module shall be equipped with a three-position override switch (auto-off-on) for manual operation. Analog output modules shall be equipped with a two-position override switch (manual-auto) and a built-in potentiometer.
- 4. Provide programmable intermediate ranges and linearization table for sensor types specified under the heading, "Sensors". For all RTD type temperature sensors of 1000 ohms or less, individually calibrate each input point via precision decade box to compensate for lead length errors.
- 5. Thermistor type temperature sensors shall require programmable calibration constant unique to a specific resistance group. Submit temperature versus resistance curves for each thermistor used with the logarithmic equation specific to that thermistor group.
- 6. Digital input types supported by the CU:
 - a. Normally open contacts. (24V and 120V)
 - b. Normally closed contacts. (24V and 120V)
 - c. Current/no current
 - d. Voltage/no voltage
- 7. The CU shall accommodate both digital and true analog outputs. Voltage (0-12V) and current (4-20 mA) outputs shall be accommodated. All analog outputs shall be proportional current or voltage type with a minimum incremental resolution of 0.5% of the full operating range of the actuating device (not 0.5% of 0-12V output). Match the proportional range of the output to the full operating range of the actuating device. Use zero and maximum output voltage or current values for shut-down and close-off modes. For troubleshooting and load analysis, the value of each analog output shall be available in the database for trending and display.
- 8. Digital outputs shall be capable of handling maintained as well as pulsed outputs for momentary or magnetic latching circuits. It shall be possible to configure outputs for 3-mode control (fast-slow-off) and 2-mode control.
- 9. The analog/digital resolution process shall be 10 bit based. The digital to analog resolution process shall be a minimum of 10 bit.
- C. Accessories: Provide the following with each Control Unit:
 - 1. On/Off switch
 - 2. Overcurrent and transient power protection
 - 3. NEMA 1 enclosure

D. CU Software:

1. General: A CU shall operate totally standalone and independent of a central computer for all specified control applications. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.
2. O.S. Software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage CU to CU and CU-to-SCU communications, and scan inputs and outputs. O.S. shall also contain built in diagnostics.
3. Input/Output Point Processing Software shall include:
 - a. Continuous update of input and output values and conditions. All connected points are to be updated at a minimum of one-second intervals.
 - b. Analog to digital conversion, scaling and offset, correction of sensor non-linearity, sensing no response or failed sensors, and conversion of values to 32 bit floating point format. Both the maximum and minimum values sensed for each analog input are to be retained in memory. It shall be possible to input subsets of standard sensor ranges to the A/D converter and assign gains to match the full-scale 32-bit conversion to achieve high accuracy readout.
 - c. A reasonability check on all analog inputs against the previously read value and discard those values falling outside pre-programmed reasonability limits.
 - d. Assignment of proper engineering units and status condition identifiers to all analog and digital input and outputs.
 - e. Analog input alarm comparison with the ability to assign two individual sets of high and low limits (warning and actual alarm) to an input or to assign a set of floating limits (alarm follows a reset schedule or control point) to the input. Each alarm shall be assigned a unique differential to prevent a point from oscillating into and out of alarm. Alarm comparisons shall be made each scan cycle.
 - f. Debounce of digital inputs to prevent nuisance alarms. Debounce timing shall be adjustable from two seconds to two minutes in one-second increments.
4. Command Software:
 - a. Command Control software shall manage the receipt of commands and from the central control unit, portable engineer's terminal.
 - b. Command delay shall be provided to prevent simultaneous energizing of loads. Delay must be programmable from 0 to 30 seconds.

- c. Each command shall be assigned a command and residual priority to manage contentions created by multiple programs having access to the same command point. Only outputs with a higher command priority shall be permitted to execute. Whenever a command is allowed to execute, its assigned residual priority shall replace the existing residual priority.
 - d. A "fixed mode" option shall be supported to allow inputs to, and outputs from DDC control programs to set to a fixed state or value. When in the "fixed mode" inputs and output shall be assigned a high residual command priority to prevent override by application programs.
 - e. A last user record is to be maintained to positively identify which program or manual command is in control of a given point. The last user information shall be displayed along with other point data on the CRT display of logical groups.
- 5. Alarm Lockouts:
 - a. Alarm lockout software shall be provided to prevent nuisance alarms. On initial start-up of air handler and other mechanical equipment, a "timed lockout" period shall be assigned to analog points to allow them to reach a stable condition before activating alarm comparison logic. Lockout period is to be programmable on a per point basis from 0 to 90 minutes in one-minute increments.
 - b. A "hard lockout" shall also be provided to positively lock out alarms when equipment is turned off or when true alarm is dependent on the condition of an associated point. Hard lockout points and lockout initiators are to be operator programmable.
 - c. Design the power supply to accommodate the power requirements of all components (or nodes) connected, plus 50%.
- 6. Run Time Totalization or Point Trending:
 - a. Run time shall be accumulated based on the status of a digital input point. It shall be possible to totalize either on time or off time up to 10,000 hours with one-minute resolution. Run time counts shall be resident in non-volatile memory and have CU resident run time limits assignable through the operator's terminal.
 - b. Totalized run time or trended data shall be batch downloaded using FTP to the SCU on a daily or weekly basis. Trended data shall reside on the User Interface database server. The automatic update of this data shall be determined by the User Interface and facility management application requirements.
- 7. Transition Counting: A transition counter shall be provided to accumulate the number of times a device has been cycled on or off. Counter is to be non-volatile and be capable of accumulating 600,000 switching cycles. Limits shall be assignable to counts to provide maintenance alarm printouts.
- 8. Custom DDC Control Loops:

- a. Custom DDC programs are to be provided to meet the control strategies as called for in the sequence of operation sections of these specifications. Each CU shall have residential in its memory and available to the programs a full library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences:
 - 1) Proportional Control, Proportional plus Integral (PI), Proportional plus Integral plus Derivative (PID), and Adaptive Control (self-learning): The adaptive control algorithm shall be used on control loops, as indicated in I/O summary, where the controlled medium flow rate is variable (such as VAV units and variable flow pumping loops). The adaptive control algorithm shall monitor the loop response characteristics in accordance with the time constant changes imposed by variable flow rates. The algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of the system dynamics so that on system shutdown and restart, the learning process starts from where it left off and not from ground zero. Standard PID algorithms are not acceptable substitutes for variable flow applications since they will provide satisfactory control at only one flow rate and will require continued manual fine-tuning.
 - 2) All DDC setpoints, gains and time constants associated with DDC programs shall be available to the operator for display and modification via the SCU operator interface, one portable operator's terminal and User Interface workstation.
 - 3) The execution interval of each DDC loop shall be adjustable from 2 to 120 seconds in one-second increments.
 - 4) DDC control programs shall include an assignment of initialization values to all outputs to assure that controlled devices assume a fail-safe position on initial system start-up.

2.3 LON ROUTERS, BRIDGES, REPEATERS AND TRANSCEIVERS:

A. Routers, Bridges and Repeaters:

1. Equip each router and bridge with a network transceiver on each network port (inbound and outbound) as dictated by the network type (Type 1 - FTT, Type 2 - TP, Type 3 - PL, Type 4 - LP, Type 5 - RF).
2. The network router shall be designed to route messages from a segment, sub-net, or domain in full duplex communication mode.
3. Routers and bridges shall utilize LonTalk® protocol transport, network, and session layers to transparently route messages bound for a node address in another sub-net or domain.

4. Routers, bridges and repeaters shall be fully programmable and permit a systems integrator to define message traffic, destination, and other network management functions utilizing LONWORKS®, Network Servers (LNS) and Net Profiler installation tools through the LON Manager Software package or other LNS API based Network Management tool.
5. The routers, bridges, and repeaters shall be capable of DIN rail or panel mounting and be equipped with status LED lights for Network traffic and power.
6. Provide a minimum of (2) Neuron 3150 processors for use as the network router communication controller.

B. Transceivers:

1. Type 1 Network Transceiver, Free Topology, Twisted Pair: Provide a transformer isolated, twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:
 - a. Meets LONMARK™ Interoperability Association Standards.
 - b. Differential Manchester encoded signaling for polarity insensitive network wiring.
 - c. Transformer isolated for common mode rejection.
 - d. 78kbs network bit rate up to distances of 2000m.
 - e. Free topology supports star, home run, multidrop and loop wiring topologies.
 - f. Complies with FCC and VDE requirements.
 - g. UL recognized component.

2.4 DIGITAL CONTROLLER CAPABILITIES:

A. Field Programmable:

1. The controller shall contain all necessary mathematics, logic, utility functions and all standard energy calculations and control functions in ROM to be available in any combination for field programming the unit. These routines shall include but not be limited to:
 - a. Math routines:
 - 1) Basic arithmetic
 - 2) Binary logic
 - 3) Relational logic
 - 4) Fixed formulas for psychrometric calculations

- b. Utility routines for:
 - 1) Process entry and exit
 - 2) Keyboard functions
 - 3) Variable adjustments and output
 - 4) Alarm indication
 - c. Control routines for:
 - 1) Signal compensation
 - 2) Loop control
 - 3) Energy conservation
 - 4) Timed programming
- 2. Final field programs shall be stored in battery backed up RAM.
- B. Calibration Compensation:
 - 1. The digital controller shall sense the voltage being supplied to the resistance sensing element and through firmware and shall compensate for power supply changes due to ambient temperature changes at the power supply.
- C. Diagnostics:
 - 1. The digital controller shall continuously perform self-diagnostics. All malfunction shall alarm the front-end system.
- D. Default Operating Procedure and Alarms:
 - 1. All variables shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.
 - 2. All alarms shall be indicated at the digital controller and at the front-end system.
- E. Energy Management Functions:
 - 1. The controller shall be capable of performing the following energy management functions:
 - a. Time of day scheduling
 - b. Start/Stop optimization
 - c. Peak demand limiting

- d. Duty cycling (temperature compensated)
 - e. Occupied/Unoccupied mode
 - F. User Specified Programs:
 - 1. The controller shall be capable of generating programs specified by the user including:
 - a. Intermediate season control (dead zone)
 - b. Trending of variables
 - c. Historical data storage
 - d. Totalizing
 - e. Holiday and event programming
 - G. Control Loop Compensation:
 - 1. Control loop compensation shall include:
 - a. Hysteresis correction
 - b. Limited control output
 - c. Ramp output
 - d. Anti-reset windup
 - H. Access Levels:
 - 1. The controller shall have a minimum of three levels of passwords as follows:
 - a. Level One - Read all setpoints
 - b. Level two - Program occupied periods
 - c. Level Three - Program all setpoints and programs

2.5 GRAPHICS:

- 1. Graphics shall operate thru the microprocessor and shall be dynamic and animated.
- 2. The graphic software shall display and update current control point data.
- 3. Notification of alarms from the panels must be provided on the graphic display while the system is in graphics mode.

4. A library of HVAC symbols shall be provided for use in generating custom displays. The graphic symbols shall include fans, pumps, valves, chillers, air handlers, cooling towers, rooftop units and boilers.
5. The graphic display shall indicate alarm conditions for each air handling unit.
6. The graphic display shall display a global graphic for each building, which shall include status of air handling units, smoke exhaust fans, exhaust fans, dampers and alarm conditions.

2.6 OWNERS WITH EXISTING FRONT END SYSTEMS:

- A. The building automation system shall be fully compatible with the existing building automation system. When this facility is brought on-line, the existing front-end hardware and software shall be upgraded as necessary to support the graphics, sequences and other functions of the building automation system.
- B. The data, information and graphical representations of the systems at this facility shall be equal to or greater than that installed for other facilities in the District or as indicated in these specifications, whichever is greater.
- C. Connect the building controls back to the existing building automation system using wireless or wired technology. Provide full control of the buildings from the existing building automation system.
- D. Controls contractor shall perform all the necessary database work (in the Jase and Server) to add the new system to the district's existing graphics package. The controls contractor shall utilize the district's existing standards and provide graphics and object databases consistent with the district's existing system.

PART 3 - EXECUTION

3.1 OPERATION:

- A. Upon restoration of power, equipment shall be sequentially started, and shall at no time, exceed last demand limit setting.

3.2 CONTROL UNITS AND INTELLIGENT DEVICES:

- A. As a minimum, provide a separate Control Unit for each major piece of HVAC equipment. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.
- B. Intelligent Devices can be used to meet the functional specification requirements in lieu of Control Units. However, provide a supervising control node to provide global supervision over all nodes utilized to fulfill the same function otherwise provided by Control Units.
- C. Future use of spare capacity shall require providing the field device, field wiring, point database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.

END OF SECTION 23 0904.02

SECTION 23 0993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS AND POINTS LIST

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

B. Description:

1. Points shown for equipment shall be for each item of equipment except:
 - a. When noted otherwise.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0900 - Instrumentation and Control for HVAC (General)
 2. Section 23 0993.2 - Sequence of Operation (Air Handling Equipment)

PART 2 - SEQUENCE OF OPERATION

2.1 SEQUENCE DESCRIPTION AND DEFINITIONS:

A. General:

1. These sequence descriptions and definitions shall apply to all sequences unless sequence specifically indicates otherwise.

B. Morning Warm-Up/Cool-Down:

1. This mode is the mode between night setback and normally occupied mode and is used to bring area served from unoccupied conditions to conditions required for occupancy.
2. This mode typically will operate with outside air systems closed or de-energized.
3. The start time of this mode shall be determined by the building automation system based upon space temperatures, building characteristics, outside temperature, and historical ability of each system to warm up or cool down the building.

C. Night Setback:

1. This mode is the unoccupied mode.
2. This mode is a timed function of adjustable duration.
3. This mode typically will operate with outside air systems closed or de-energized and is used primarily to maintain unoccupied space temperature (adjustable) or space humidity level (adjustable).
4. All HVAC equipment required to maintain space conditions shall be energized in this mode.

D. Override:

1. When override is activated, the system shall operate with that zone, equipment, or system in the occupied mode.
2. At the end of the override time period, the zone equipment or system shall return to the mode scheduled at that time.

E. Setpoints:

1. All time durations and temperature setpoints shall be field adjustable.
2. Temperatures shall be settable to any temperature.
3. Time of day operations shall be settable to any time.
4. Time delays shall generally be settable as follows:
 - a. 0-60 second delay: settable from 0-300 seconds.
 - b. 0-5 minute delay: settable from 0-60 minutes.

2.2 OUTSIDE AIR CONTROL:

- A. Where motorized dampers are specified, the dampers shall open to maintain the airflow quantity indicated on the equipment schedule.

2.3 SETPOINTS:

- A. In general, the specification indicates setpoints or range of setpoints for most devices. The contractor shall adjust setpoints in the following manner:
1. As required to start-up, test, debug and otherwise ensure equipment and system is operating as intended.
 2. Dampers, actuators, and similar devices should be left in their optimum operating position.

3. Thermostats, humidistats, and similar devices should be left as indicated on drawings or in specifications. If no value is indicated, contractor should set at a reasonable value.
4. Equipment and system schedules should be reviewed with the Owner and A/E prior to initiating the schedule.

2.4 FAILURE MODES:

A. General:

1. Initiating devices shall each be hard wired.
2. Manual reset of temperature alarm and pressure alarm shall be required. Other alarms shall automatically reset unless manual reset indicated.

B. High Condensate Level:

1. Upon a rise in condensate level in the auxiliary drain pan, the float switch shall de-energize the unit.

2.5 SPACE HEATING DEVICES:

A. Unless stated otherwise, all devices not utilized for reheat shall be scheduled off by any of the following means:

1. Night setback thermostat
2. Timed schedule
3. Outside air temperature setpoint

2.6 SYSTEM OPTIMUM START:

- A. The building automation control system shall provide an optimum start sequence for the HVAC system.
- B. Optimization shall be determined by a comparison of indoor and outdoor environmental conditions and system capacities.
- C. At the completion of optimum start, the building shall be at design temperatures. This is not necessarily, and in most cases will not be, the same time as the start of the occupied period. For example, the completion of optimum start could be set at 7 am and the occupied mode set at 9 am. The occupied mode is typically when ventilation air would be energized.

2.7 ALARMS:

- A. In addition to the alarms indicated, all temperatures and other monitored or sensed conditions that fall above or below the normal range shall be alarmed.

- B. Alarms shall be assigned a level of alarm (minimum three levels - low (maintenance), high (important), and critical).

PART 3 - POINT SCHEDULE

3.1 DEFINITION OF POINTS:

A. Binary Output:

- | | |
|------------------|------------------------|
| 1. Control Relay | - Energize/de-energize |
| 2. Hand/Off/Auto | - Starter |

B. Analog Output:

- | | |
|--------------------|--|
| 1. Cooling | - Control Valve |
| 2. Heating | - SCR Heater |
| 3. Position Adjust | - Fan Drives
Pump Drives
Dampers
VAV Damper |

C. Binary Input:

- | | |
|--------------------------|---------------------------------|
| 1. Differential Pressure | - Fan Status |
| 2. Pressure Switch | - Pressure |
| 3. Flow Switch | - Fan Status |
| 4. Fire/Smoke | - Smoke Detector
Fire Sensor |
| 5. Freeze | - Low Limit |
| 6. Filter | - Filter Pressure |
| 7. Setback Override | - Night Setback
Override |

D. Analog Input:

- | | |
|--------------------|-------------------|
| 1. Humidity | - Humidity |
| 2. Temperature | - Temperature |
| 3. Static Pressure | - Static Pressure |
| 4. Fan Speed/Load | - Fan Drives |
| 5. Air Flow | - Air Flow |

23 0993 - 5

END OF SECTION 23 0993

SECTION 23 0993.2 - SEQUENCE OF OPERATION (AIR HANDLING EQUIPMENT)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

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.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
 1. Section 23 0993 - Sequence of Operation for HVAC Controls and Points List

PART 2 - SEQUENCE OF OPERATION

2.1 EXHAUST AND SUPPLY FANS:

- A. Fans shall be controlled as shown on the schedule.
- B. Fans under timed control shall be off during unoccupied mode except in override mode.
- C. Provide auxiliary contacts for start/stop for all fans not temperature controlled.
- D. A motorized damper associated with a fan shall open when fan is energized.

END OF SECTION 23 0993.2

SECTION 26 0500 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL CONDITIONS

1.1 WORK INCLUDED:

- A. The work covered under these sections of the specifications consists of furnishing all labor, equipment, supplies and materials, and of performing all operations, including cutting, channeling, chasing, excavating and backfilling necessary for the installation of complete wiring systems, raceways, wiring, and electrical equipment in accordance with this section of the specifications and the accompanying drawings.
- B. The Electrical Work shall include, but not be limited to, the following:
 - 1. Electrical distribution system
 - 2. Wiring devices
 - 3. Raceway system
 - 4. Conductors and cables
 - 5. Lighting and lighting controls
 - 6. Fire Alarm system extensions

1.2 RELATED WORK:

- A. Related work to Division 26:
 - 1. Division 1
 - 2. The provisions, conditions, and requirements preceding and including general and supplemental conditions apply to and are a part of Divisions 26, 27 and 28.

1.3 DEFINITIONS:

- A. Provide: Furnish and install complete ready for use, including all accessories required for operation.
- B. Furnish: Purchase and deliver to the project site complete with every necessary appurtenance, support and accessories required for operation.
- C. Install: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.

1.4 DESCRIPTION OF SYSTEMS:

- A. Furnish and install all materials for systems, resulting upon completion, in functioning systems in compliance with performance requirements specified. The omission of express reference to any parts necessary for or reasonably incidental to a complete installation shall not be construed as a release from furnishing such parts.

- B. The wiring specified and shown on the drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer's requirements shall be made at no cost to either the contract or to the Owner. Changes in electrical service to equipment due to substitutions of equipment by any Divisions of this specification shall be at no additional cost to the Owner.

1.5 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.
- B. Equipment and material which are not covered by UL Standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards, such as NEMA, ICEA or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- C. All equipment of one type (such as panelboards, breakers, etc.) shall be the products of one manufacturer.

1.6 REQUIREMENTS OF REGULATORY AGENCIES/CODE COMPLIANCE:

- A. Contractors shall submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.
- B. All work shall conform to the following Building Codes:
 - 1. National Electrical Code (NEC-2014)
 - 2. National Electrical Safety Code (NESC) latest edition
 - 3. International Building Code (IBC 2015)
- C. All work shall conform to all federal, state and local ordinances.
- D. References to the National Electrical Code and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the NEC and NFPA.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. All products shall be new (except where noted) and unused and without blemish or defect.

2.2 SUBSTITUTIONS:

- A. All requests for substitutions should be submitted so as to be received by the Architect/Engineer at least 10 working days before bid date and must be approved before award of Contract.
- B. Submittals shall be concise, clear, and brief as possible. Requests shall be accompanied by samples, descriptive literature and engineering information, as necessary, to fully identify and appraise the product.
- C. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a table of compliance that is enclosed with the submittals. The table of compliance shall clearly identify all deviations from the specifications with clear proof of equality for each case of deviation. Each item in the table of compliance shall be marked to show specification reference including the section and paragraph numbers.
- D. Contractor shall be responsible for verifying all dimensions with available space conditions (with provisions for proper access, maintenance, part replacement, and for coordination with other trades--electrical, plumbing, structural, etc.) for proper services, and construction requirements. Contractor to bear any additional cost for required changes in associated items which are directly or indirectly related to a substituted unit.
- E. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required.
- F. Approval of the equipment does not relieve the contractor of the responsibility of furnishing and installing the equipment at no additional cost.
- G. Where Contractor substitutes equipment manufactured by an alternative vendor other than the Specification approved first named manufacturer, the Contractor shall become responsible for the operation of the product in the intended system, including all related costs required to make the design work, function, and fit in the allocated space.

PART 3 - EXECUTION

END OF SECTION 26 0500

SECTION 26 0519 - WIRE AND CABLE - BUILDING WIRE (600 VOLTS AND BELOW)

PART 1 - GENERAL

1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of the building wire for power and lighting circuits.
- B. Unless otherwise specified in other sections of these specifications, control wiring shall be provided, installed, and connected to perform the functions specified in other sections of these specifications.
- C. Unless otherwise specified in other sections of these specifications, communication and signal wiring shall be provided, installed, and connected to perform the function specified in other sections of these specifications.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
 - 2. All other Division 26000 sections

1.3 WORK INCLUDED:

- A. The work under this section consists of furnishing materials and equipment, performing labor and services necessary for the installation of the electrical cable and wiring system shown on the drawings and hereinafter specified.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Building Wire (Power and Lighting):
 - 1. Cable and wire shall be in accordance with UL, NEC, as shown on the drawings, and as hereinafter specified.
 - 2. Conductors:
 - a. Shall be annealed copper.
 - b. Shall be stranded for sizes No. 8 and larger. Sizes No. 10, and smaller shall be solid.
 - c. Size shall be not less than shown on the drawings. Minimum size shall be No. 12 AWG.

3. Insulation: Unless otherwise shown on the drawings, insulation shall be as follows:
 - a. THWN - Dry Locations.
 - b. THHN - Dry, Damp Locations.
 - c. XHHW - Dry, Damp, Wet Locations.
4. Color Code:
 - a. All secondary service, feeder, and branch circuit conductors shall be color coded as follows:

<u>208/120 Volt</u>	<u>Phase</u>	<u>480/277 Volt</u>
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
 - b. All No. 12 and No. 10 branch circuit conductors shall have solid color compound or solid color coating.
 - c. No. 8 AWG and larger phase conductors shall have either:
 - 1) Solid color compound or solid color coating.
 - 2) Stripes, bands, or hash marks of colors specified above.
 - 3) Colored pressure-sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of three inches for all terminal points, and in all junction boxes, pull boxes, troughs, manholes, and handholes. Tape shall be 3/4-inch wide with colors as specified above. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.
 - d. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.

B. Splices and Joints:

1. Shall be in accordance with UL and NEC.

2. Branch circuits (No. 10 AWG and smaller):
 - a. Connectors shall be solderless, screw-on, pressure cable type, 600 volt, 105 degree C, with integral insulation. They shall be approved for copper conductors, and shall be reusable.
 - b. The integral insulator shall have a skirt to completely cover the stripped wires.
 - c. The number, size, and combination of conductors as listed on the manufacturers packaging shall be strictly complied with.
3. Feeder Circuits:
 - a. Connectors shall be indent, hex screw, or bolt clamp-type. Material shall be high conductivity and corrosion-resistant.
 - b. Connectors for cable sizes 250 MCM and larger shall have not less than two compression indents.
 - c. Splices and joints shall be insulated with materials approved for the particular use, location, voltage, and temperature. Insulation shall be not less than that of the conductors being joined.
 - d. Plastic electrical insulating tape:
 - 1) Tape shall be flame retardant, cold and weather resistant.
- C. Control Wiring:
 1. Unless otherwise specified in other sections of these specifications, control wiring shall be as specified for power and lighting wiring.
 2. Wire size shall be large enough so that the voltage drop under inrush conditions will not adversely affect operation of the controls.
- D. Fire Alarm Wiring:
 1. See Specification 28 3111 for requirements.
- E. Wire Lubricating Compound shall be suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, as shown on the drawings, and as hereinafter specified.
- B. All wiring shall be installed in raceway systems, except where direct burial is shown on the drawings.

- C. Cables and wires shall be spliced only in outlet boxes, junction boxes, pull boxes, manholes, or handholes.
- D. Cable supports shall be installed for all vertical feeders in accordance with the NEC. They shall be of the split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- E. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.
- F. Cable and wire entering a building from underground shall be sealed between the wire and conduit, where the cable exits the conduit, with a nonhardening approved compound.
- G. Wire Pulling:
 - 1. Suitable installation equipment shall be provided to prevent cutting or abrasion of conduits during pulling of feeders.
 - 2. Ropes used for pulling feeders shall be made of suitable nonmetallic material.
 - 3. Pulling lines for feeders shall be attached by means of either woven basket grips or pulling eyes attached directly to the conductors.
 - 4. All cables to be pulled in a single conduit shall be pulled in together.

3.2 FIELD TESTING:

- A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.
- B. Test shall be performed by megger and conductors shall test free from short-circuits, grounds, and opens.
- C. Conductors shall be tested phase-to-phase and phase-to-ground.

END OF SECTION 26 0519

SECTION 26 0533 - METALLIC CONDUITS/RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, grounded raceway systems.
- B. Types of raceways in this section include the following:
 - 1. Galvanized rigid metal conduit (GRC)
 - 2. Intermediate metal conduit (IMC)
 - 3. Electrical metallic tubing (EMT)
 - 4. Flexible metal conduit
 - 5. Liquidtight flexible metal conduit
- C. The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
 - 2. All other Division 26000 sections

1.3 QUALITY ASSURANCE:

- A. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- B. UL Compliance and Labeling: Comply with provisions of UL safety standards pertaining to raceways systems; and, provide products and components which have been UL listed and labeled.
- C. NEC Compliance: Comply with requirements as applicable to construction and installation of raceway systems.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT:

- A. Metal rigid steel conduit shall conform to ANSI C80.1 and Underwriter's Laboratories UL-6 specification, ANSI C80.1.

- B. Conduit shall be hot-dipped galvanized to provide a corrosion resistant coating.
- C. Fittings: Fittings shall be ANSI/NEMA FB 1 threaded type, hot dipped or electronic plated. Threaded conduit to be secured to boxes, cabinets, etc., by means of galvanized threaded bushings on the inside and bond-type locknuts on the inside and outside of such boxes and cabinets. Fittings shall be watertight and the same material as conduit installed with factory manufactured elbows.

2.2 RIGID INTERMEDIATE STEEL CONDUIT (IMC):

- A. Intermediate Metallic Conduit shall conform to ANSI C80.1 and proposed Underwriter's Laboratories UL 1242 specification.
- B. Conduit shall be hot-dipped galvanized to provide a corrosion resistant coating. Intermediate Metallic Conduit (IMC) shall have galvanized/metallized thread protection, and pipe interior shall be protected by corrosion inhibiting coating.
- C. Fittings: Shall be similar to GRC.
- D. Maximum allowable size shall be (4) inches.

2.3 ELECTRICAL METALLIC TUBING (EMT):

- A. Electrical metallic tubing shall conform to ANSI C80.3 and Underwriter's Laboratories UL 797.
- B. EMT shall be hot-dipped galvanized steel with internal coating of silicone epoxy lubricant to assist in wire pulling.
- C. Fittings: Shall be compression type, steel or malleable iron. Set screw or indentation type of fittings are not acceptable.

2.4 FLEXIBLE METAL CONDUIT:

- A. Flexible metal conduit shall conform to UL 1.
- B. Flexible conduit to be of hot-dipped galvanized interlocked spirally wound steel strip.
- C. Fittings shall be multiple point type, threading into the internal wall of the conduit convolutions, and shall have insulated throat. Connectors to be galvanized and be suitable for connection to associated boxes and conduits.

2.5 LIQUID TIGHT FLEXIBLE METAL CONDUIT:

- A. Liquid-tight flexible metal conduit shall conform to UL 360.
- B. Liquid-tight flexible metal conduit shall consist of flexible galvanized steel tubing over which is extruded a liquid-tight jacket of polyvinyl chloride (PVC). Conduit shall be provided with a continuous copper bonding conductor wound spirally between the convolutions.

- C. Fittings used shall be reusable type of malleable iron/steel construction, electro zinc plated inside and outside, furnished with nylon insulated throat and taper threaded hub. Connectors to be galvanized and be suitable for connection to associated boxes and conduits.

2.6 CONDUIT SUPPORTS:

- A. All parts and hardware shall be zinc-coated or have equivalent corrosion protection.
- B. Pipe straps: Fed. Spec. FF-S-760, type 1, style A or B.
- C. Individual conduit hangers: Shall be designed for the purpose, and have pre-assembled closure bolt and nut, and provisions for receiving hanger rod.
- D. Multiple conduit (trapeze) hangers shall be not less than 1-1/2 x 1-1/2 inch, 12 gage steel, cold formed, lipped channels. Hanger rods shall be not less than 3/8 inch diameter steel.
- E. Solid masonry and concrete anchors: Fed. Spec. FF-S-325 shall apply. Anchors shall be GROUP III self-drilling expansion shields, or machine bolt expansion anchors GROUP II type 2 or 4, or GROUP VII.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION SCHEDULE:

- A. Power distribution feeders such as feeders for switchboards, panelboard, transformers, etc.:
 - 1. Above Grade - GRC or IMC
 - 2. Underground - S40 (PVC) (with green insulated grounding conductor sized in accordance with NEC 250-102).
 - 3. Conduits installed in cast-in-place concrete: PVC externally coated GRC or IMC.
- B. Motor feeders: Same requirements as power distribution feeders.
- C. Branch circuits from panelboards (not described above):
 - 1. Exposed to weather - GRC or IMC
 - 2. Concealed dry interior location - EMT.
 - 3. Exposed dry interior locations - GRC IMC within 8 ft. of finished floor, EMT above 8 ft.
 - 4. Underground - S40 (PVC).
 - 5. Conduits installed in cast-in-place concrete: PVC externally coated GRC or IMC.

- D. Data system conduits: Same requirements as branch circuits.
- E. Fire alarm system conduits: Same requirements as branch circuits.
- F. Security system conduits: Same requirements as branch circuits.
- G. Sound, clock and/or TV systems conduit: same as for branch circuits.

3.2 CONDUIT INSTALLATION - GENERAL:

- A. Installation shall be in accordance with UL, NEC, as shown on the drawings, and as hereinafter specified.
- B. Contractor shall lay out and install conduit runs to avoid proximity to hot pipes. In no case will a conduit be run within three inches of such pipes, except where crossings are unavoidable and then conduit shall be kept at least one inch from the covering on pipe crossed.
- C. Conduits shall be supported as required to comply with applicable paragraphs of the NEC.
- D. Conduit installation shall be as follows:
 - 1. Installed as complete runs before pulling in cables or wires.
 - 2. Flattened, dented, crushed or deformed conduit is not permitted and shall be removed and replaced at no cost to the Owner.
 - 3. Installed so they will not obstruct head room, walkways, doorways or work by other trades.
 - 4. Cut square with a hacksaw, reamed, burrs removed, and drawn up tight.
 - 5. Mechanically and electrically continuous.
 - 6. Supported within one foot of all changes of direction, and within one foot of each enclosure to which connected.
 - 7. Ends of empty conduit to be closed with plugs or caps at rough-in stage to prevent entry of debris until wires are pulled in.
 - 8. Conduits shall be secured to cabinets, junction boxes, pull boxes, and outlet boxes by bonding type locknuts.
 - 9. See architectural detail for conduit penetrations of roof membrane.
- E. Conduit Bends:
 - 1. Shall be made with standard conduit bending machines.
 - 2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.

3. Conduits shall not be bent with a pipe tee or vice.
- F. Conduit shall be securely fastened in place at intervals as specified by the code using suitable straps, hangers and other supporting assemblies. All strap hangers and supporting assemblies:
1. Shall be of rugged construction capable of supporting weight with a reasonable factor of safety.
 2. Shall be adequately protected against corrosion.
- G. In wet locations or in locations where corrosive conditions are present, vertical and horizontal runs of conduit shall be firmly supported so that there is at least 1/4" air space between the conduit and the wall or supporting surface. Spacers and supporting straps shall be of malleable iron construction, hot dipped galvanized.
- H. EMT shall be securely fastened in place at intervals as specified by the code using straps, hangers and other supporting assemblies.
1. Spacers and supporting straps shall be of rugged malleable iron or steel construction hot dipped galvanized.
- I. Flexible conduit when installed shall have sufficient slack to avoid sharp flexing and straining due to vibration and thermal expansion/contraction. Conduit shall be installed in such a manner that liquids will tend to run off the surface instead of draining towards the fittings.
- J. Concealed work installation:
1. In concrete:
 - a. Conduit shall be run in direct lines.
 - b. Conduit shall not be installed through concrete beams, except where shown on the structural drawings or as approved by the Engineer prior to construction, and after submittal of drawing showing locations size, and position of each penetration.
 - c. Conduit shall not be installed in concrete which is less than three inches thick.
 - d. Conduit outside diameter larger than 1/3 of the concrete thickness is not permitted.
 - e. Spacing between conduits in slab shall be approximately six conduit diameters apart except one conduit diameter at conduit crossings.
 - f. Conduits shall be installed approximately at the center of the slab.
 - g. Couplings and connections shall be water tight. Thread compounds shall be UL approved conductive type to ensure low resistance ground continuity through the conduits.

2. Conduit shall be run parallel or perpendicular to the building lines.
 3. Branch circuit conduits, and conduits feeding ceiling lighting shall not be supported by the suspended ceiling, lighting fixtures, or air conditioning ducts.
 4. Recessed lighting fixtures shall be connected to conduit with not over six feet of flexible metal conduit.
- K. Exposed work installation:
1. Conduit shall be run parallel or perpendicular to the building lines.
 2. Horizontal runs shall be installed close to the ceiling or beams and secured with approved conduit straps.
 3. Horizontal or vertical runs shall be supported at not over eight foot intervals.
- L. Surface metal raceways:
1. Surface metal raceways shall be used only where shown on the drawings.

3.3 UNDERGROUND INSTALLATION:

- A. Tops of conduits shall be:
1. Not less than 24 inches and not less than shown on the drawings below finished grade.
 2. Not less than 30 inches and not less than shown on the drawings below road and other paved surfaces.
 3. Shall not be installed above power company direct burial primary feeder.
- B. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.
- C. For excavation and back-filling, see Section 260501 ELECTRICAL COORDINATION.
- D. Seal conduits, including spare conduits, at building entrances and at outdoor terminations for equipment with a suitable compound to prevent the entrance of moisture and gases.
- E. Underground conduits shall be encased in not less than 3" of red concrete (all around) where run outside of building slab.

3.4 MOTORS AND VIBRATING EQUIPMENT:

- A. Flexible metal conduit shall be used for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Flexible metal conduit shall be liquid-tight when installed in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, and locations subject to seepage or dripping of oil, grease or water. Flexible metal conduit shall be installed with green ground wire.

3.5 CONDUIT SUPPORTS, INSTALLATION:

- A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
- B. Pipe straps or individual conduit hangers shall be used for supporting individual conduits.
- C. Multiple conduit runs shall be supported by trapeze hangers. Trapeze hangers shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 200 pounds. Each conduit shall be attached by U-bolt or other approved fastener.
- D. Conduit shall be supported independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, etc.
- E. Solid Masonry and Concrete: Fasteners shall be as follows:
 - 1. New construction: Generally, steel or malleable iron concrete inserts in concrete prior to pouring.
 - 2. Existing construction:
 - a. Steel expansion anchors not less than 1/4-inch bolt size and not less than 1-1/8 inch embedment.
 - b. Power set fasteners shall be approved, and not less than 1/4-inch diameter with depth of penetration not less than three inches.
 - c. Anchors or fasteners attached to concrete ceilings shall be vibration and shock resistant.
- F. Hollow masonry. Toggle bolts are permitted. Bolts supported only by plaster are not acceptable.
- G. Metal structures. Fasteners shall be machine screw or devices specifically designed and approved for the application.
- H. Attachments by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking is not permitted.
- I. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- J. Vertical supports. Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown on the drawings. Supports for cable and wire shall have fittings which include internal wedges and retaining collars.

3.6 DATA CONDUIT:

- A. Install a complete empty conduit system for data service.
- B. Minimum size conduit shall be 3/4", but not less than shown on the drawings.
- C. Conduit bends and elbows shall be long radius.

3.7 SOUND, FIRE ALARM, AND SECURITY SYSTEM CONDUIT:

- A. All wiring shall be installed in conduit.
- B. Size all conduit as required per NEC and manufacturers' recommendations for number of wires or cables but minimum size shall be 3/4".
- C. Install junction boxes and pull boxes as required for each system.
- D. Conduit bends shall be long radius.

3.8 PULL WIRES:

- A. Install a # 14 gauge fish wire in all empty conduits, except telephone and communications. Install a nylon pull string in telephone and communication conduits.

3.9 PAINTING:

- A. Exposed conduit shall be painted; see Section 09900, PAINTING.

END OF SECTION 26 0533

SECTION 26 0534 - RIGID NON-METALLIC (PVC) CONDUITS/RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. This section includes the furnishing, installation, and connection of rigid plastic (PVC) conduit, fittings, and boxes to form complete and coordinated raceway systems.
- B. The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
 - 2. All other Division 26000 sections
- B. See section on Substitutions.

PART 2 - PRODUCTS

2.1 RIGID PVC FOR ENCASED BURIAL:

- A. Conduit shall be UL rated 90°C and to UL-651. Fittings shall conform to UL-514.
- B. Conduit shall be S40 wall thickness made from polyvinyl chloride (recognized by UL) compound which includes inert modifier to improve weatherability and heat distortion. Conduit and couplings shall be homogenous plastic material free from visible cracks, holes, or foreign inclusions. Conduit bore shall be smooth and free from blisters, nicks, or other imperfections which could mar conductors or cables.
- C. Bends: 90° bends shall be made with galvanized rigid steel with bitumastic coated (externally) elbows. Bends other than 90° shall be made from S80 PVC conduit.
- D. Where conduit rises from ground use PVC externally coated galvanized rigid conduit.

PART 3 - EXECUTION

3.1 SPECIFICATION SECTION 260533, PART 3, EXECUTION SHALL APPLY.

END OF SECTION 26 0534

SECTION 26 0923 – AUTOMATIC LIGHTING CONTROL

PART 1 - GENERAL:

1.1 SCOPE OF WORK:

- A. Furnish, install, and connect all conduit, fittings, boxes, controls, control wiring, and all other devices, whether specified/indicated or not, to produce a complete and functional automatic lighting control system.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1 of the building construction documents
 - 2. All other Division 26 sections
 - 3. All Division 27 and 28 sections

1.3 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.
- B. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- C. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data, and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.
- D. Submit scaled lighting plans clearly marked by manufacturer showing proper product, location, and orientation of each sensor. Scale shall match that used in the Contract Documents.
- E. Submit manufacturers cut sheets, including sensor performance information indicating compliance to the specification.

1.4 AS BUILT DRAWINGS:

- A. Section 260500, ELECTRICAL GENERAL REQUIREMENTS, shall apply.

1.5 RESPONSIBILITY:

- A. All equipment to be the responsibility of the single lighting control manufacturer.
- B. All variations from the specified equipment must be approved by the Architect, Owner and Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Watt Stopper, Inc. (basis of design) or preapproved Equal. For preapproval, provide all of the information required for review **a minimum of ten (10) working days prior to the initial bid date.**
- B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

2.2 PRODUCTS

- A. All products numbers listed are those Watt Stopper. See plans for part numbers and device descriptions. Provide latest version of devices superseding part numbers shown on plans.
- B. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet, and half-step motion up to 1,000 square feet.
- C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277 volts, and shall have 180 degree coverage capability.
- D. Bi-level wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277 volts.
- E. Passive Infrared and Dual Technology sensors shall have fully automatic operation.
- F. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
- G. All sensors shall have tool-less accessible, user adjustable controls for time delay and sensitivity. Controls shall be concealed to limit tampering.
- H. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
- I. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance to assure reliable performance and eliminate sensor crosstalk. Sensors using multiple frequencies are not acceptable."
- J. All sensors shall provide a method of indication to verify that motion is being detected during testing and that the unit is working.
- K. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Log-

ging, and other control options. Sensors utilizing separate components to achieve this function are not acceptable.

- L. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.
- M. Wall switches shall be provided with oversized stainless steel device plates.

2.3 CIRCUIT CONTROL HARDWARE

- A. For ease of mounting, installation and future service, control unit(s) shall be able to mount within J boxes and be an integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low voltage power to a minimum of three (3) sensors.
 - 1. Relay Contacts shall have ratings of:
 - 2. 13A 120 VAC Tungsten
 - 3. 20A 120 VAC Ballast
 - 4. 20A 277 VAC Ballast

2.4 CONTROL WIRING:

- A. Control wiring between sensors and controls units shall be Class II, 1824 AWG stranded U.L. Classified, PVC insulated or Teflon jacketed cable approved for use in plenums, where applicable.
- B. Control wiring shall be installed in conduit, size as required for cabling.

PART 3 - EXECUTION

3.1 GENERAL:

- A. It shall be the contractor's responsibility with the manufacturer's assistance to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas.
- B. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

3.2 GUARANTEE:

- A. Guarantee shall be total and complete and shall be for one (1) year starting with the date of total project acceptance.

END OF SECTION 26 0923

SECTION 26 2200 - DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. This section includes the furnishing, installation, and connection of dry type transformers to form complete, coordinated, grounded distribution systems.
- B. The term transformer, as used in this specification, shall mean any or all of the transformer types specified.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
- B. See section on Substitutions.

1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC as applicable to installation and construction of dry type transformers.
- B. UL Compliance: Provide transformers and components which are listed and labeled. Comply with provisions of UL 506 and UL 1561.
- C. ANSI/NEMA: Comply with all applicable ANSI/NEMA standards (ANSI C89.2, NEMA ST-20), unless more stringent requirements are required by the specifications or drawings.

1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 26 0500, ELECTRICAL GENERAL REQUIREMENTS.
- B. The specific item proposed and its area of application shall be marked on the catalog cuts.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Equipment delivery shall be scheduled just prior to installation to minimize on site storage time and possible damage from adverse conditions. Deliver, store and handle transformers in accordance with manufacturers written instructions and the following:
 - 1. Transformers shall be stored in dry interior locations completely protected from weather, adverse conditions and construction activity. Equipment shall be considered in storage until such time switchboard is energized and any time power is removed for 4 hours or more.

2. Remove loose packing, flammable materials and shipping braces from inside transformers and install temporary electric heating, size as indicated in manufacturers written instructions.

PART 2 - PRODUCTS

2.1 GENERAL TRANSFORMER SPECIFICATIONS:

- A. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.
- B. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be tightly clamped and compressed. The completed core and coil shall then be bolted to the base of the enclosure but isolated therefrom by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500 KVA and smaller, the vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices will not be acceptable.
- C. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed and finished with a grey, baked enamel.
- D. Basic Impulse Level (BIL): Shall be 10kv minimum.
- E. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.
- F. Sound levels shall be guaranteed by the manufacturer not to exceed the following:

1. Up to 9 KVA:	40 dB
2. 10 to 50 KVA:	45 dB
3. 51 to 150 KVA:	50 dB
4. 151 to 300 KVA:	55 dB
5. 301 to 500 KVA:	60 dB
6. 501 to 700 KVA:	62 dB
7. 701 to 1000 KVA:	64 dB
8. 1001 to 1500 KVA:	65 dB

2.2 DRY TYPE TRANSFORMERS (15 KVA AND LARGER):

- A. Transformers 15 KVA and larger shall have a minimum of 6-2 1/2% full capacity primary taps, 2 above and 4 below normal voltage.

- B. Transformers 15 KVA and larger shall have 220 degrees C insulation with 150°C rise based on 40°C ambient.
- C. Transformers 15 KVA and larger shall be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code standards for ventilated enclosures.
- D. Mounting: Provide transformers of the floor mounting type.

2.3 SPECIFIED MANUFACTURING

- A. Transformers shall be manufactured by one (1) of the following, or approved equal:
 - 1. General Electric
 - 2. Square D
 - 3. Siemens
 - 4. Eaton

PART 3 - EXECUTION

3.1 TRANSFORMER MOUNTING (FLOOR):

- A. All transformers shall be installed on six (6) inch raised concrete pads. Include 1/4" reinforcement basis in a grid pattern eight (8) inches on center in the raised pad.
- B. Bolt transformer to the raised pad.

3.2 TRANSFORMER MOUNTING (WALL):

- A. Where wall mounted or suspended transformers are indicated on plans, coordinate requirements and installation of wall-mounting and structure-hanging supports with building structure and transformer provided.

END OF SECTION 26 2200

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. This section includes the furnishing and installation, at locations shown on the drawings, of approved panelboards of a type indicated and specified herein.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
 - 2. All other Division 26000 sections

1.3 QUALITY ASSURANCE:

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in the NEC, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NEC.
- F. Panelboards shall comply with UL 67.
- G. Cabinet and boxes shall comply with UL 50.

1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

C. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Service Conditions: NEMA PB 1.

1.6 COORDINATION:

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.7 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.
- B. Keys: Two spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 LABELING:

- A. All panels shall be UL labeled.
- B. All panels used as a service entrance, shall be labeled as such.
- C. A nameplate shall be provided listing panel type and ratings.

2.2 GENERAL PANELBOARD CONSTRUCTION:

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.
- B. Distribution, Lighting, and Appliance Panelboards: Provide dead-front safety constructed factory assembled circuit breaker type panelboards in sizes and ratings as indicated. Construct with rectangular shaped copper or tin plated aluminum bus bars which are securely mounted and braced, and with lugs bolted to main bus bars.

1. Provide anti-turn solderless pressure type lug connectors approved for copper conductors, and construct unit for connecting feeders at top of panel.
 2. Equip with full-sized neutral bus bar with suitable lugs for circuits requiring neutral connection. Provide suitable lugs on neutral bus for each outgoing feeder required.
 3. Provide main and branch circuit breakers. Breakers shall be molded case bolt-in type, heavy-duty, quick-make, quick-break, with toggle handles that indicate when tripped. Where multipole breakers are indicated, provide with common trip so that overload on one pole will trip all poles simultaneously.
 4. Provide bare uninsulated grounding bars suitable for bolting to enclosures.
 5. Load center type panelboards are not acceptable, unless specifically called for in drawings.
- C. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide door-in-door front, with flush locks and keys, all panelboard enclosures keyed alike. Door hinges shall be piano hinges. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.
- D. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to circuit breakers as recommended by panelboard manufacturer for ratings and applications indicated.
- E. Panelboards shall be shown in the following schedule, or approved equal, and shall be completely factory assembled. Do not purchase panelboards or cabinets until shop drawings have been approved.
1. Branch Circuit Panelboards (120/208 or 120/240 V Operation). Minimum cabinet width shall be 20".

Square D	NQ
General Electric	AQ
Eaton	PRL1a
Siemens	P1
 2. Branch Circuit Panelboards (277/480 V Operation). Minimum cabinet width shall be 20".

Square D	NF
General Electric	AD
Eaton	PRL3a
Siemens	P2/P3
 3. Distribution Panelboards (600 Amp bus & Larger).

Square D	I-Line
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General Electric
Eaton
Siemens

Spectra Series
PRL4B
P4/P5

- F. Where a specific interrupting rating is shown on the drawings, panelboards and associated circuit breakers shall be rated for that value as a minimum. **Series ratings of equipment is not acceptable.**

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELBOARDS:

- A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A.
- D. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- E. Provide properly wired electrical connections within enclosures.
- F. Fill out panelboard's circuit directory card upon completion of installation work. Type text, handwriting is not acceptable. Directory shall reflect actual installation configuration and shall incorporate final room numbers. Room numbers shown on architectural plans shall not be used for the directory.
- G. Installation shall comply with the NEC.
- H. Anchor to walls per manufacturer's recommendation.
- I. Lace all feeder cables with tie wraps in panel housing. All wiring shall be run square inside housing.
- J. Vacuum panel housing to remove all dust and dirt from housing prior to final inspection.
- K. Cover panel housing prior to room painting. Clean all paint from panel.
- L. Provide engraved plastic identification label black face with white lettering, indicating panelboard name, voltage system, and upstream distribution including room name and number. Attach identification labels to panel with rivets or sheet metal screws.
 - 1. Labels for panels fed from the emergency power system shall have red faces with white lettering.

3.2 GROUNDING:

- A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounds.

3.3 FIELD QUALITY CONTROL:

- A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check panelboards for electrical continuity of circuits, and for short circuits.
- D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units and then retest to demonstrate compliance.

END OF SECTION 26 2416

SECTION 26 5100 - LIGHTING

PART 1 - GENERAL

1.1 SCOPE:

- A. This section included the furnishing, installation, and connection of light fixtures, conduit, lamps, fittings, and boxes to form complete, coordinated, grounded interior lighting systems.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
 - 1. Division 1
 - 2. All other Division 26000 sections

1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC as applicable to installation and construction of lighting fixtures.
- B. UL Compliance: Provide lighting fixtures which have been UL listed and labeled.
- C. CBM Labels: Provide fluorescent lamp ballasts which comply with certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.

1.5 COORDINATION OF CEILING TYPE:

- A. Determine the exact ceiling to be furnished in each area and obtain fixtures to suit. Deviate from specifications only where necessary and to the extent necessary to ensure fixture-ceiling compatibility.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES - GENERAL:

- A. Shall conform to the drawings and fixture schedule.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, and as shown on the drawings.

- B. Align, mount, and level the lighting fixtures uniformly.
- C. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.
- D. Use earthquake clips on all fixtures.
- E. Support fixtures securely from building structure. Grid ceiling framing members shall not be used to support fixtures.

3.2 CLEAN-UP AND RE-LAMPING:

- A. Before final acceptance of the electrical work in all or any part of the building, the Contractor shall clean the bottoms, the trim, the reflecting surfaces, lenses, baffles, reflector cones and lamps of all lighting fixtures.
- B. Mask the trim and bottoms of all lighting fixtures if necessary to protect the fixture during construction.
- C. Review and ensure that all light sources installed are exactly as specified for each fixture type.
- D. Replace all inoperative fixtures so that all lighting fixtures will be in first class operating condition upon acceptance.

END OF SECTION 26 5100